

A HANDBOOK
OF THE
THEORY AND PRACTICE OF MEDICINE
VOLUME II

A HANDBOOK

OF THE

THEORY AND PRACTICE

OF

MEDICINE

BY

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THEORY AND PRACTICE OF MEDICINE.

CHAPTER I.

DISEASES OF THE CIRCULATORY ORGANS.

I. CLINICAL PHENOMENA CONNECTED WITH THE HEART.

THE evidences of disease in connection with the central organ for the circulation of the blood are necessarily not confined to this part alone, but must be more or less apparent throughout the entire system. It is essential to notice, however, at the outset, that most grave organic cardiac mischief may be unattended with any evident symptoms; and that, on the other hand, apparently serious disturbance of the heart may be observed, which is entirely of a functional character. Moreover, other diseases are often associated with cardiac affections, especially renal and pulmonary, and these may greatly modify the symptoms.

1. Various **subjective sensations** are often experienced about the cardiac region, viz., pain, either constant or of a paroxysmal and anginal character, oppression, dragging, sinking, or unpleasant sensations associated with the movements of the heart; such as palpitation, irregularity, jogging, rolling, falling back, jumping into the throat, intermittency, or complete stoppage. These are sometimes attended with extreme distress and dread of death. There may be local tenderness; or, on the other hand, relief may be afforded by pressure.

2. The **action of the heart** is frequently disturbed, being feeble almost to cessation, excited, palpitating, irregular, or intermittent.

3. Symptoms may result from **excessive action of the heart**, especially about the head and face, such as dull heavy headache, with a sense of fulness and rushing of blood; throbbing sensations; giddiness; noises in the ears; flashes and specks before the eyes; flushing of the face; or heat of head. In short, there are the usual signs of active congestion, which may even terminate in rupture of the vessels of the brain, or in epistaxis. When the right ventricle is acting unduly, symptoms indicating active congestion of the lungs are liable to arise.

4. On the other hand, **deficient cardiac action** gives rise to special symptoms, dependent upon an insufficient supply of arterial blood, namely, either those of actual syncope; attacks of an apoplectic or epileptiform character; or merely a state of habitual want of vigour and incapacity for any exertion, with coldness and clamminess, especially of the extremities, pallor, and a tendency to faintness.

5. A most important series of phenomena associated with cardiac diseases may result from **mechanical interference with the**

circulation of the blood, in consequence of which *the pulmonary or general venous system or both become overloaded, this being also commonly accompanied with imperfect oxygenation of the blood, and deficient supply to the arteries, the latter causing a more or less marked anæmic appearance. When the *pulmonary circulation* is involved, bronchial catarrh, pulmonary congestion or œdema, or even hæmorrhage may result, attended with the usual symptoms. Long-continued congestion will lead to thickening, or atheromatous or calcareous degeneration of the pulmonary vessels; proliferation of cellular tissue in the lungs, with excessive formation of pigment; or emphysema. Allusion may here be made to the characters of ordinary *cardiac dyspnœa* or so-called *cardiac asthma*. The difficulty of breathing resembles that of exertion, being more or less hurried, panting or gasping, and noisy. It is subject to much variation, being liable to come on in very severe paroxysms, breathing being quite free and undisturbed in the intervals, the fits occurring particularly after any effort, especially after ascending heights, or when the patient lies down or falls asleep. The act of respiration is not interfered with, hence it is not very frequent, nor is expiration prolonged as in emphysema, while the respiratory movements and sounds are quite free. Of course if the lungs are involved the characters of the breathing will be modified accordingly, and true bronchial asthma may be observed. A peculiar disturbance of respiration has been described by Cheyne in fatty disease of the heart, in which the act becomes gradually hurried and deeper up to a certain point, and then subsides by degrees until at last there is a momentary cessation of breathing, with a dead silence. Involuntary sighing is occasionally observed.

When the *general venous system* is obstructed, the various tissues and organs of the body become mechanically congested, and the consequences of this stagnation follow, namely, serous effusion; permanent enlargement of capillaries and small veins; increase of connective tissue, with thickening and contraction; or rupture of vessels, with hæmorrhage. It is necessary to consider in some detail the symptoms resulting from these morbid conditions:—*a.* As the result of the general venous plethora, the patient often presents a more or less cyanotic appearance, especially about the lips, fingers, and toes; with pallor, from deficient supply of arterial blood. In time the face becomes puffy and bloated, and the finger ends clubbed. The patient feels chilly, and is deficient in vitality and vigour, being disinclined for any exertion, languid, apathetic, and easily fatigued. Sooner or later *dropsy* sets in, usually beginning in the feet and ankles and extending upwards, and ending in general anasarca with serous effusions. As a rule it is gradual in its onset and progress, and often subsides temporarily under appropriate treatment; in some instances, however, it is rather rapid in its appearance, and then relief may follow as regards chest-symptoms. If general cardiac dropsy comes on rapidly, it is usually more easily got rid of and less likely to return soon, than when it is gradual in its progress. In connection with the venous congestion and dropsy, cutaneous lesions are liable to be set up in the legs, namely, erythema, erysipelas, eczema, rupture of the skin, sloughing, or chronic ulceration. *b.* Some very striking symptoms result from

disturbance of the circulation in the central nervous system. These are dull, heavy headache; sensations of giddiness and unsteadiness; sleepiness—sleep, however, being disturbed by startings and most unpleasant dreams; mental obscuration with irritability, want of resolution and stability, indisposition to mental effort, and impairment of the intellectual powers generally; disturbances of vision and hearing, there being also in time objective changes in connection with the eyes; curious sensations or twitchings in the extremities. Ultimately gradual sopor ending in complete coma may supervene; or apoplexy or ventricular effusion may occur. *c.* The digestive and assimilative organs also readily suffer in most cases. The tongue becomes full, large, congested, and marked with the teeth; the mouth and throat often at the same time present venous congestion. The stomach becomes the seat of catarrh with increased secretion of mucus, leading to dyspeptic symptoms, such as sensation of fulness in the epigastrium, flatulence, eructations, and deficient or depraved appetite. From intestinal congestion results constipation or diarrhoea, or an alternation of these symptoms; and in course of time hæmorrhoids may be originated. The liver is at first congested and enlarged, and a certain amount of jaundice is often evident, this being partly due to congestion of the mucous membrane lining the bile-ducts. The bile also is liable to be unhealthy, owing to an admixture of mucus from the gall-bladder, and this increases the difficulty of digestion. Ultimately the liver may become the seat of a form of cirrhosis. After a time the spleen tends to become permanently enlarged. *d.* Undoubtedly the kidneys may be involved, becoming venously congested and probably finally cirrhotic; hence at first the urine is deficient in quantity, dark, concentrated, and of high specific gravity, deposits urates, and contains more or less albumen, as well as casts in some cases. There may be pain and tenderness over the renal region. Catarrh of the bladder occasionally occurs. *e.* From congestion of the genital organs symptoms commonly arise in females, namely, menorrhagia, metorrhagia, leucorrhœa, and possibly metritis. In males there is a diminution in sexual power and inclination; while prostatic enlargement and hydrocele have been supposed to be occasionally due to cardiac affections.

6. Very dangerous symptoms may arise in connection with disease of the heart, from the formation of clots and other matters in its cavities, portions of which are also liable to be conveyed into the circulation as *emboli*, inducing local symptoms associated with obstructed arteries, or giving rise to general contamination of the blood.

7. In exceptional instances certain conditions of the heart or pericardium may originate symptoms by causing pressure on neighbouring structures.

8. Cardiac affections will necessarily influence materially the state of the pulse, from which most important information may be gained. In all cases, therefore, the pulse ought to be thoroughly investigated in all the particulars to be presently described; and it is requisite also to examine carefully in order to determine whether the arteries are in a condition of degeneration or not.

9. In rare instances rupture of the heart occurs, with consequent escape of blood, necessarily leading to grave symptoms.

II. CLINICAL PHENOMENA CONNECTED WITH THE ARTERIES.

1. Occasionally there may be pain, throbbing, tension, or other **subjective sensations** associated directly with some diseased condition of an artery; and tenderness is not uncommon.

2. **Pressure on neighbouring structures** gives rise to an important class of symptoms in connection with aneurismal dilatation of arteries. Only aneurisms within the chest or abdomen, however, come specially under the notice of the physician. At present the symptoms due to pressure within the chest will alone be considered. They may result from the pressure of any mediastinal tumour, and therefore the description here given will apply to all forms of mediastinal enlargement, it being borne in mind that the exact symptoms must necessarily depend upon the situation, shape, size, direction and rate of growth, and other characters of the tumour; that it is rare for the whole of those mentioned to be observed in the same case; and that they are liable to change, owing to an alteration in the direction of growth or other causes. The modes in which pressure contributes to the production of symptoms may be summed up generally as follows:—
a. By causing displacement, as of the heart, trachea, or large vessels; and altering the relation of orifices. *b.* By pressing upon hollow tubes or organs, and obstructing them to a greater or less degree, *e.g.*, the air-tubes, œsophagus, great vessels, thoracic duct, heart. *c.* By compressing the substance of organs, and thus preventing them from performing their functions, *e.g.*, the lungs. *d.* By leading to actual destruction of tissues, as of the chest-walls, spinal cord, walls of hollow tubes, pericardium or heart, lungs, nerves. *e.* By irritating or paralyzing nerves, symptoms being often thus set up at a distance from the seat of mischief. *f.* By exciting local inflammation, ending in exudation, adhesions, or suppuration.

Such being the general effects of pressure, the special symptoms may be considered according as the pressure tends in an outward or *centrifugal*, or an inward or *centripetal* direction.

(i.) *Centrifugal symptoms*.—In addition to obvious physical signs, pressure on the parietes of the thorax will excite pain, either neuralgic, or due to inflammation of various structures; or to destruction of bone, when it tends to be heavy, grinding, or gnawing in character. When neuralgic, the pain often shoots in various directions, as up along the neck or down the arm. There may be merely a sense of weight and oppression, or heat; or indefinable feelings may be complained of. Tenderness is frequently observed, and sometimes extreme hyperæsthesia. Actual paralysis of nerves may ultimately be caused. If the vertebral column is eaten through, symptoms associated with the spinal cord are set up, first indicative of irritation, and subsequently of destruction.

(ii.) *Centripetal symptoms*.—*a.* Pressure on the right side of the heart or pulmonary artery will interfere with the supply of blood to the lungs, and thus aid in causing dyspnoea, while it leads to general overloading of the venous system. The action of the heart is very liable to be disturbed when this organ is pressed upon. *b.* Obstruction of the main

arteries—innominate, carotid, or subclavian—will alter the characters of the corresponding carotid or radial pulse, diminishing its fulness and force, or delaying it. *c.* Most important symptoms result from pressure on the large systemic veins, usually the superior vena cava, either innominate, or the vena azygos major. Very rarely is the inferior cava interfered with. Venous congestion, œdema, enlargement of capillaries and veins, the formation of coagula, or actual rupture of vessels follow, the nature and extent of the symptoms necessarily depending upon the vein which is obstructed, being usually confined to the head, face, neck, chest, and arms, and either bilateral or unilateral. The face, especially the lips, is often puffed and livid, presenting distended capillaries. The neck may be full, thickened, and tumid-looking, having a peculiar spongy or elastic feel, somewhat resembling that of erectile tissue. The throat is often congested and forms abundant secretion. More or less severe cerebral symptoms result from the venous congestion of the brain, and deafness is sometimes complained of. If the vena azygos is pressed upon, there are signs of spinal congestion, viz., sensory and motor disturbances in the lower part of the body. Should the inferior cava be interfered with, there will be anasarca of the legs and abdominal walls, accompanied with ascites and other signs of obstruction involving the abdominal circulation. *d.* Rarely the pulmonary veins are compressed, causing pulmonary congestion and its consequences. *e.* The various morbid conditions set up in connection with the main air-tubes or lungs will cause more or less severe dyspnoea, cough, hæmoptysis, alterations in voice, and other symptoms. Frequently marked laryngeal symptoms are present, either due to direct pressure; to chronic laryngitis and ulceration, which may be the result of mere irritation of the nerves; or to functional nervous disturbance. When hæmoptysis occurs, the blood sometimes resembles "currant jelly." *f.* From œsophageal obstruction dysphagia may result; and if food cannot be taken, emaciation necessarily follows. Rarely hæmatemesis takes place. *g.* Extreme emaciation is said to be the consequence of obstruction of the thoracic duct. *h.* Pressure on nerves originates numerous clinical phenomena, some of which have been already noticed. Interference with the vagus nerves or pulmonary plexuses disturbs breathing and cardiac action. The recurrent nerves, especially the left, are peculiarly liable to be pressed upon, severe laryngeal symptoms and dysphagia being thus excited. Pressure on the phrenic nerve will affect the action of the diaphragm. Diminution in the size of the pupil of the eye, or, more rarely, dilatation, depends upon more or less disturbance of the sympathetic; this also may affect the temperature and nutrition of one side of the head and face. Some of the nerves forming the brachial plexus are in exceptional instances so pressed upon as to lead to various disorders of sensation, especially pain, or even to paralysis of the arm; and pressure on the intercostal nerves may cause pain in, or paralysis of the corresponding muscles.

I may be allowed to digress here to draw attention to the absolute necessity of an intelligent knowledge of the medical anatomy of the thoracic contents, as well as of the functions of the various structures, before the symptoms due to pressure can be at all comprehended.

3. **Obstruction of an artery** will be followed by symptoms dependent upon the want of a proper supply of arterial blood in the part to which the obstructed vessel normally conveys it. These will vary not only with the organ or part which is thus deprived of blood, but also according to the degree and rapidity of obstruction. If sudden and complete, it will lead to immediate abolition of functions, and thus may induce serious symptoms, as in the case of the brain, in connection with which sudden loss of consciousness and hemiplegia may follow obstruction of an artery; or when the main artery of a limb is blocked up, which is followed by local paralysis. If the obstruction is more gradual it causes anæmia, diminution of temperature, depression of functions, and deficient nutrition, which may end in softening or actual gangrene. The pulse also is more or less weakened to complete extinction in the arteries which receive their blood from that which is obstructed; while in the portion of the obstructed artery nearer the heart there is increased pulsation.

4. Diseased conditions of arteries may originate **emboli** or **substances which contaminate the blood**, thus giving rise to symptoms of obstruction in distant parts, or to general symptoms indicating septicæmia.

5. Serious phenomena, both local and general, will necessarily attend the **rupture of an artery**, if it is of any size.

6. **The Pulse.**—To *feel the pulse* has always been justly looked upon as one of the first duties of a medical practitioner. This gives invaluable information in general diseases and various affections connected with other organs which influence the heart and vessels, as well as with regard to special morbid conditions of these structures. The subject will be considered in detail under **PHYSICAL EXAMINATION**.

III. CLINICAL PHENOMENA CONNECTED WITH THE VEINS.

1. There may be **pain, tenderness, or cutaneous redness** in the course of veins. 2. When veins are **obstructed** in any way, local formation of clots being the most frequent cause, there will be the signs of venous congestion already described, varying in extent and situation according to the vessel or vessels involved. 3. **Emboli** may originate from clots in veins, and be conveyed to various parts of the body. Septic matters may also be formed.

IV. PHYSICAL EXAMINATION OF THE CIRCULATORY ORGANS.

The chief modes of physical examination available in the investigation of the circulatory system are similar to those already described in connection with the lungs. In addition, two special instruments are employed, namely, the **sphygmograph** and the **cardiograph**. The latter records graphically the movements of the heart, but has scarcely been used as yet to an extent sufficient to make it available for ordinary practice; the former is an important instru-

ment, and will call for more detailed consideration. Dr. Gowers has invented a combined **cardio-sphygmograph**.

The nature of the information afforded by the different modes of examination in connection with the heart and vessels may be thus summarised. **Inspection** reveals:—1. Any alteration in the shape and size of the chest over the cardiac region; or any bulging corresponding to an aneurism. 2. Certain points about the impulse of the heart. 3. The amount of visible pulsation in the great arteries of the neck; the existence of abnormal pulsation; and certain conditions of the arteries of the limbs. 4. The state of the superficial veins, as well as of the large veins in the neck, especially the right external jugular. **Palpation** indicates:—1. Any local change in size and shape. 2. The precise characters of the cardiac impulse. 3. The presence of any cardiac thrill or pericardial friction-fremitus. 4. The condition of the large arteries of the neck; the characters of any abnormal pulsation, whether visible or not; and the state of the arteries of the limbs. 5. Certain signs connected with the veins of the neck. **Mensuration** merely gives more accurate information with regard to form and size. **Percussion** discloses:—1. Any alteration affecting the cardiac dulness: and the amount of resistance felt over this region. 2. Abnormal dulness due to an aneurism. **Auscultation** is mainly useful for investigating certain sounds, namely:—1. **Sounds connected with the heart.** (i.) The ordinary *cardiac sounds*. (ii.) Abnormal sounds originating within the heart, named *endocardial murmurs*, usually depending upon some morbid condition in connection with the orifices and valves. (iii.) *Pericardial murmurs* or *friction-sounds*, due to roughness of the surfaces of the pericardium. 2. **Arterial sounds and murmurs**, especially, in the large arteries of the chest and neck, but which may also be observed in the smaller arteries. 3. **Venous murmurs.** It may be mentioned that the stethoscope may also prove very serviceable in realizing certain characters of the cardiac impulse or of an aneurismal pulsation, through the sensations thus conveyed to the head. Vocal fremitus and resonance may also be made use of with advantage in some cases, in order to aid in determining the limits of the heart.

I proceed now to consider specially the PHYSICAL EXAMINATION of the several parts of the circulatory system.

A. EXAMINATION OF THE HEART.

I. CHANGES IN THE FORM AND SIZE OF THE CARDIAC REGION.

1. **Bulging.** This varies much in degree, but may extend from the second to the seventh or eighth rib, while the sternum may be partly involved. The intercostal spaces are either normal or unduly prominent. Measurement shows that there is a greater distance from the nipple to mid-sternum on the left than on the right side. Bulging is most liable to occur in young persons. *Causes.* (i.) Enlargement of the heart, especially hypertrophy. (ii.) Pericardial effusion.

2. **Depression.** There may be a general falling-in over the cardiac

region : or the spaces are sometimes chiefly affected. *Cause.* Pericardial agglutination, with adhesion of its outer surface to the chest-wall.

II. CARDIAC IMPULSE.

The cardiac impulse is investigated by *inspection*, *palpation*, and in some cases by the aid of the *stethoscope*. In health the apex-beat is usually felt in the fifth left interspace, about $1\frac{1}{2}$ inches below and $\frac{3}{4}$ inch inside the nipple, over an area of about an inch. It is single, and systolic in time ; slightly heaving and gliding down towards the left ; gradual and not abrupt in its development.

IMPULSE IN DISEASE.—When examining the cardiac impulse, the chief points to be noticed are :—1. Its exact position, and whether this is constant or varies with different beats of the heart. 2. Its area as seen and felt ; and if it is well-defined or not. 3. Its force. 4. The characters it presents to the touch. 5. Its rhythm. 6. The effects of change of posture upon it.

1. **Position.** The impulse may be displaced by conditions external to the heart ; morbid changes in the pericardium ; alterations in the size of the heart itself ; or a combination of these causes. (i.) *Elevation.* The apex-beat is often raised to the fourth space or higher. *Causes.* *a.* Pushing up of the heart by some abdominal accumulation, such as ascites or an enlarged liver. *b.* Upward traction, owing to diminution in the bulk of the lung from contraction of a cavity in the left apex, or to a less extent in the right, with the formation of adhesions. *c.* Pericardial effusion, or adhesion after pericarditis. *d.* Diminution in the size of the heart, from atrophy or great loss of blood. (ii.) *Depression.* The impulse is often lowered, and may reach as low as the seventh or eighth rib. *Causes.* *a.* Cardiac enlargements, especially hypertrophy, either general or affecting the left side. *b.* An aneurism or other tumour above the heart, pushing it down. *c.* Pericardial effusion in some cases. *d.* Weakness of the great vessels, owing to some acute or long-continued illness, allowing the heart to sink down. (iii.) *Lateral displacement,* either to the right or left, is very common, being often combined with elevation or depression. *Causes.* *a.* Pushing aside of the heart by a collection of fluid or gas in either pleural cavity, especially the left ; by an enlarged lung, due to emphysema, hypertrophy, or cancer ; or by an aneurism or other tumour. *b.* Cardiac enlargements. According to the nature of the enlargement and the part of the heart affected, the impulse will be carried more to one side or the other. As a rule it may be stated that hypertrophy tends to displace the impulse towards the left ; dilatation towards the right. *c.* Pericardial effusion, which always carries the apex-beat to the left. (iv.) Occasionally the impulse *alters its position* with each beat of the heart, when this organ is greatly dilated.

2. **Area, and degree of definition.** (i.) The area of the cardiac impulse is often *increased* to a variable extent, being either well-defined* or the reverse. *Causes.* *a.* Cardiac enlargements, especially if associated with pericardial agglutination. *b.* Excited action of the heart. *c.* Undue contact of the heart with the chest-walls, either from

retraction of the left lung; adhesion between the pericardium and costal pleura; pressure on the heart from behind by an enlarged liver or spleen or a tumour; or falling-in of the chest-walls. *d.* Pericardial effusion, in which the impulse appears to be very extensive and ill-defined. (ii.) *Diminished* area is observed in most of the conditions which weaken the impulse, but it is not of much practical importance.

3. **Force.** This may be:—(i.) *Increased. Causes.* *a.* Hypertrophy of the heart. *b.* Undue contact with the chest-walls. *c.* Excited action. (ii.) *Diminished*, sometimes to complete extinction. *Causes.* *a.* Functionally weak action of the heart from any cause. *b.* Certain cardiac diseases, such as dilatation, fatty degeneration or infiltration, and atrophy. *c.* Fluid or air in the pericardial sac. *d.* Distension of the lungs, especially the left, from emphysema or hypertrophy, in consequence of which they come between the heart and the chest-walls.

4. **Characters.** The impulse often presents unusual characters, the following being the most important:—(i.) *Undulatory* or *wave-like*. This may be only visible, or felt as well. *Causes.* *a.* Pericardial effusion. *b.* Dilatation of the heart, with thin, weak, and degenerate walls. *c.* Uncovering of the heart, with adhesion of the pericardium to the chest-walls. (ii.) *Heaving* or *pushing*. It is for the purpose of observing this character that the stethoscope is useful, through which the movement becomes often very obvious, both to the auscultator and to bystanders. A distinctly heaving impulse is characteristic of cardiac hypertrophy. (iii.) In dilatation the impulse is often *quick, sharp, and slapping*. (iv.) When the heart is very feeble the action may be *jerking* or *fluttering*. (v.) If pericardial agglutination exists along with hypertrophy or dilatation and valvular disease, the impulse frequently acquires very peculiar characters, differing in different cases; and there may be even a *recession* rather than an impulse.

5. **Rhythm.** (i.) *Irregularity* is often observed, both as regards force and time; or the beat may be *intermittent*. *Causes.* *a.* Functional disturbance of the heart's action. *b.* Cardiac diseases, viz., marked dilatation, fatty disease, and some cases of mitral or aortic regurgitation with enlargement of the left ventricle. *c.* Malformations of the heart. *d.* Occasionally pericardial effusion or adhesions. (ii.) In pericardial effusion the impulse sometimes seems *to lag behind the ventricular systole*, as if it took some time to be conveyed to the surface. (iii.) The systolic impulse may appear to be *double* or even *treble*; or a *diastolic* impulse may likewise be present. This is observed in some instances of dilatation and hypertrophy with adhesions.

6. **Effects of change of posture.** (i.) *Increased mobility* of the apex-beat has been considered a sign of pericardial effusion, but it is not of much importance. (ii.) The fact that the impulse *does not alter in different postures* is sometimes of much aid in determining the existence of adhesions—pericardial and pleuritic.

It is necessary to allude briefly to the impulse not uncommonly seen or felt towards the base of the heart; and to that in the epigastrium. *Basic impulse* is chiefly observed in cases where a cavity in the apex of the left lung has contracted, drawing up the heart and bringing it into close contact with the chest-walls, adhesions probably forming; but it may be due to excessive hypertrophy about the base, or aneurism of the

heart. *Epigastric impulse* is generally cardiac in origin; sometimes it is the result of aortic pulsation; or, it is believed, of regurgitation into the inferior vena cava or hepatic vein. Cardiac epigastric impulse is either due to displacement of the heart or enlargement of the right ventricle; or it may be the natural consequence of a short thorax.

III. PECULIAR SENSATIONS FELT OVER THE CARDIAC REGION.

1. **Thrill or purring tremor.** These terms sufficiently indicate the special character of a peculiar vibratory sensation conveyed to the fingers, which is indicative of certain conditions of the orifices and valves of the heart. In order to determine the origin of a thrill, it is necessary to observe its *situation* and *synchronism*. It may be requisite to excite the heart by brisk movement before it can be felt. The different thrills which may be met with are as follows, and more than one may be present in the same case:—(i.) At the left apex—*a.* Systolic, indicating mitral regurgitation, especially if accompanied with hypertrophy and mitral obstruction. *b.* Præsystolic, associated with mitral obstruction. (ii.) Systolic in the second right interspace near the sternum, due to aortic obstruction; or more extensively if the aorta is at the same time dilated. (iii.) Diastolic, felt down the sternum, occasionally observed in connection with aortic regurgitation. (iv.) Very rarely systolic in the inner part of the second left space or opposite the third cartilage, indicative of pulmonary obstruction. (v.) Præsystolic in the fourth left space or opposite the fourth cartilage. This is a mere curiosity, but has been said to accompany tricuspid obstruction.

2. **Pericardial friction-fremitus** is very exceptionally observed in pericarditis, but it may be felt over more or less of the cardiac region. Differing in its characters entirely from a thrill, it gives the impression of being quite superficial and rubbing; is movable, and irregular as regards its site and rhythm, though usually felt chiefly during the systole; and seldom lasts for any length of time. It may be simulated by pleuritic fremitus caused by the action of the heart. A curious sensation is sometimes felt due to the morbid changes remaining after an attack of pericarditis.

IV. CARDIAC PERCUSSION.

(A.) **CARDIAC DULNESS.**—This is described as being *superficial* and *deep*. The former corresponds to the part of the heart uncovered by lung, and is triangular in shape, being bounded towards the right by a line along the middle of the sternum from between the fourth cartilages; and towards the left by a line extending obliquely from the same point to the apex. The deep cardiac dulness extends as far as the limits of the heart, but requires much practice in order to mark it out.

CARDIAC DULNESS IN DISEASE.—The points requisite to be noticed are:—1. Position. 2. Extent and directions of increase. 3. Shape.

4. Degree and quality. 5. Effects of change of posture.

1. **Position.** This may be entirely abnormal, as, for instance, when the heart is displaced to the right by pleuritic effusion.

2. **Extent and directions of increase.** (i.) The area of cardiac dulness may be *increased* more or less, this being usually associated with some change in shape. *Causes.* *a.* Abnormal contact of the heart with the chest-walls, especially when due to retraction of the lung. *b.* Enlargements of the heart, the extent and direction of the increased dulness depending upon the part of the heart involved, and the nature of the enlargement. *c.* Accumulation or clotting of blood within the cavities, or congestion of the walls of the heart, especially as the result of some pulmonary obstruction. *d.* A liquid or solid collection within the pericardium, but especially effusion from inflammation, the dulness then increasing chiefly in an upward direction; and excess of fat. *e.* Increase of cardiac dulness may be simulated by conditions external to the heart, for instance, consolidation of the margin of the lung; accumulation of fat; a solid tumour; or aneurism of the aorta. (ii.) *Diminution* in cardiac dulness is not reliable in determining the condition of the heart, but is often most useful in indicating distension of the lungs, especially the left. *Causes.* *a.* Atrophy of the heart. *b.* Great loss of blood and consequent emptiness of the cavities. *c.* Accumulation of air in the pericardium. *d.* Hypertrophy or emphysema of the lungs.

3. **Shape.** The form of the cardiac dulness often affords important evidence as to the cause of any increase in its extent. In pericardial effusion it tends to be triangular, with the base down and the apex upwards. In hypertrophy it becomes elongated vertically; in dilatation lateral enlargement takes place, especially towards the right, and the shape is square or circular. The form of dulness, however, will be modified according to the part of the heart involved, and the degree in which the two conditions are combined.

4. **Degree and quality.** The degree of dulness sometimes affords a distinction between pericardial effusion and cardiac enlargement, being more marked in the former. If the pericardium or heart is calcified, the percussion-note may become somewhat osteal in quality.

5. With **change of posture** the dulness due to pericardial effusion may be made to alter in extent and form.

(B.) **RESISTANCE.**—The sensations conveyed to the fingers on percussion are not very reliable in the diagnosis of cardiac affections; but the sense of resistance is likely to be more marked in pericardial effusion than in hypertrophy.

V. AUSCULTATION OF THE HEART.

(A.) SOUNDS OF THE HEART.

It is essential to have a clear comprehension of the mode of action of the heart and of the sounds associated therewith, before auscultation can be of any value in the investigation of the morbid conditions of this organ. With regard to the sounds, it is requisite to know the characters of each; how these differ as examination is made over different parts of the thorax; and the mechanism of their production.

During each action of the heart, on listening over the apex-beat

there may be noticed in succession :—1. A systolic sound, synchronous with the contraction of the ventricles. 2. A short silence. 3. A diastolic sound at the moment when the ventricles cease to contract, and the aortic and pulmonary valves close. 4. A longer silence, which is again followed by the systolic sound. As regards duration, they bear about the following proportion to each other, dividing an entire cardiac action into tenths :—

<i>Systolic sound.</i>	<i>1st interval.</i>	<i>Diastolic sound.</i>	<i>2nd interval.</i>
$\frac{4}{10}$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$

At the *left apex, i.e.*, just within and below the nipple, the systolic sound is prolonged and well-defined ; much accentuated ; it seems muffled and rather deep ; and is of rather low pitch. The diastolic is much shorter, sharper, and more abrupt ; clearer ; more superficial ; and higher-pitched. At the *right apex, i.e.*, over the base of the ensiform cartilage, both sounds are clearer and higher-pitched than at the left, and the systolic is less accentuated, shorter, and sharper. Comparing the sounds at the *base* and *apex*, it will be found that at the base the diastolic sound becomes relatively the more marked. It is loud and distinct ; well-accentuated ; clear and often ringing : while the systolic sound is dull and indefinite ; shorter ; and without any accent. At the *right base, i.e.*, opposite the second right space or third cartilage close to the sternum, the sounds are usually louder than at the corresponding point on the left side, especially the diastolic. Finally, it must be noticed that the sounds are generally better heard under the left clavicle and over the left side posteriorly than over the corresponding regions on the right side. It is now generally acknowledged that the *systolic* sound is due chiefly to the tension of the mitral and tricuspid valves, and the muscular contraction of the ventricles ; though it is supposed by some writers to be influenced by the impact of the apex of the heart against the chest-walls, the rush of blood through the aortic and pulmonary orifices, and its collision with the blood already in these vessels. The *diastolic* sound results mainly from tension of the aortic and pulmonary valves ; but partly, according to Sibson, to tension of the whole root of the aorta.

In auscultating the heart in order to detect abnormal conditions, it may be necessary to make the patient stop breathing for a moment ; to excite the heart by a little brisk movement ; or to examine in different postures. In order to compare the sounds at the base and apex, some authorities recommend the use of a double stethoscope, so that they may be heard simultaneously, but the ordinary instrument answers perfectly well.

HEART-SOUNDS IN DISEASE.—It is highly important to attend to the ordinary cardiac sounds when investigating for morbid conditions, as they frequently afford most valuable information.

EXAMINATION OF THE SOUNDS AT THE LEFT APEX.—The stethoscope should first be applied over the apex-beat ; and the following are the deviations from the normal which may be met with :—

1. **Changes in intensity and apparent depth.** (i.) *Intensity increased.* *Causes.* (a.) Excited action of the heart. (b.) Approximation of the heart to the chest-walls, when the sounds also appear to

be superficial. (c.) Combined hypertrophy and dilatation, particularly if the valves are somewhat hypertrophied at the same time. (d.) Deficient quantity or a watery condition of the blood. (ii.) *Intensity diminished.* *Causes.* (a.) Feeble action of the heart. (b.) Certain organic cardiac affections, viz., atrophy; simple or concentric hypertrophy; dilatation with thinning of the walls; changes in the muscular walls, especially fatty disease, but also softening associated with fevers, and fibroid or cancerous infiltration. (c.) Collections of fluid, air, or much solid material in the pericardial sac. (d.) Distension of the left lung by emphysema or hypertrophy. In the last two conditions the sounds appear to be deep, in consequence of imperfectly-conducting materials intervening between the heart and the parietes of the chest.

2. The **pitch, quality, and degree of clearness** of the **systolic sound** may give important information as to the condition of the valves and walls of the heart; and also as to the quality of the blood. In marked hypertrophy without dilatation, the sound becomes toneless, dull, obscure, muffled, and of very low pitch. In dilated hypertrophy with some thickening of the valves it may be booming, clanging, or musical. When the heart is merely dilated it is often high-pitched, abrupt, and clicking or slapping. Anæmia frequently causes the systolic sound to become unusually sharp, clear, and high-pitched.

3. It is sometimes important to notice the **length of the systolic sound**; and to compare the **relative lengths of the sounds and intervals**. For instance, in dilated hypertrophy the systolic sound is very prolonged; there may be hardly any diastolic sound; and the intervals are shortened. In mere dilatation the diastolic sound often becomes the longer one, so as to simulate the systolic, which is much shortened. The first sound is also usually remarkably short and abrupt in mitral obstructive disease.

COMPARISON OF THE SOUNDS IN DIFFERENT PARTS OF THE CHEST.

—It is often of advantage to compare the sounds over different parts of the thorax, but especially at the apex and base of the heart; and at the right and left apex or base. As illustrations of the knowledge thus to be gained the following are important:—1. If the sounds, being weak at the apex, are louder at the base, this serves to distinguish pericardial effusion from dilatation or fatty heart. 2. Greater intensity at the right apex than the left shows either displacement or right enlargement of the heart; or that this organ is covered by some imperfectly-conducting material, especially an emphysematous lung. 3. Marked loudness and accentuation of the second aortic sound at the base often indicates obstruction in the general circulation, either due to degenerative changes in the vessels, or to renal disease, especially the granular kidney. This may be associated with a very weak first sound, owing to degeneration of the cardiac walls. A change in the aortic sound may also depend on commencing changes in the valves. 4. Louder sounds at the left base than the right, particularly the diastolic, indicate that there is some disease affecting the passage of blood through the mitral orifice, so that the pulmonary circulation is overloaded and the pulmonary artery distended. 5. Any condition, either in connection with the heart itself or external to it, which alters the position of this organ, will correspondingly modify the sounds. For example, in left

pleuritic effusion they are transferred to the right side of the chest. 6. The extent and direction of conduction of the sounds may be useful in determining the presence of disease in other organs. Thus, in consolidation at the apex of the right lung they are very often decidedly louder under the right clavicle than the left. In right basic pneumonia they are frequently very marked over the corresponding part of the chest. Cavities in the lungs may intensify the sounds considerably, or sometimes impart to them unusual characters, such as a peculiar hollowness or a metallic quality.

REDUPLICATION.—By this is meant a *doubling* of either sound. It is frequently observed, even in health, and does not as a rule indicate cardiac disease; it is not uncommonly noticed in cases of Bright's disease. Its cause is probably a want of synchronism in the action of the two sides of the heart, but reduplication of the first sound has also been attributed to a separation of its valvular and muscular elements, or to the auricular sound being heard. It may be observed with either or both sounds; and at the apex or base. Without care a reduplicated sound is liable to be mistaken for a murmur.

(B.) ENDOCARDIAL MURMURS.

An *endocardial murmur* is usually associated with one of the cardiac orifices, being either one of the ordinary sounds altered in its characters; or altogether a new sound. In order to determine the site of production and immediate cause of any murmur, it is necessary to observe:—1. The seat of its greatest intensity. 2. The directions in which it is conducted. 3. Its time, whether systolic, diastolic, præ-systolic, or post-diastolic. These being the essential characters, it is always advisable, however—4. To attend to certain other particulars, especially the duration, loudness, quality, and pitch of a murmur; and its effect upon the ordinary sounds. Thus a tolerably accurate conclusion may be arrived at with regard to the actual conditions of the valves and orifices upon which the murmur depends; the state of the heart's walls, and the manner in which this organ is acting; and the quality of the blood.

GENERAL OUTLINE OF CAUSES OF MURMURS.—1. In the large majority of cases a murmur depends upon some morbid condition in connection with one of the cardiac orifices, which either causes *obstruction* to the onward passage of the blood, or permits *regurgitation* owing to imperfect closure of the valves. (i.) *Obstruction* may arise from:—*a.* Constriction at or about an orifice, its margins being generally thickened at the same time. *b.* Some direct impediment, as from much enlarged and nodulated or adherent valves, which cannot fall back. *c.* External pressure by a tumour, fibrous thickening, or other condition, or by the stethoscope. *d.* Twisting of an orifice, with a wrong direction of the current of blood, consequent upon displacement of the heart. (ii.) *Regurgitation* may be due to:—*a.* Mere enlargement of an orifice, the valves not widening in proportion. *b.* Organic changes in the valves, which prevent them from performing their functions properly, such as actual destruction or rupture, perforation,

contraction, thickening and rigidity, or adhesion to the walls of the heart. *c.* Organic changes in the appendages of the valves, namely, the chordæ tendinæ or muscoli papillares, interfering with their closure. *d.* Mere irregular action or altered position of the muscoli papillares, which prevents the valves from falling into their places at the proper time or in the proper manner. *e.* Degeneration at the root of one of the great arteries, interfering with the adaptation of its valves. *2.* Mere roughness of the endocardium may cause a murmur, especially when due to endocarditis, and particularly if in the vicinity of an orifice. *3.* Fibrinous coagula among the columnæ carnæ or upon the surface of the valves occasionally give rise to a murmur. *4.* Cardiac murmurs may depend upon certain rare morbid conditions, such as sacculated aneurism of the heart; abnormal communication between the cavities of the heart, or between either of these and one of the great vessels; or dilatation of the aorta at its commencement, the orifice being unaltered. *5.* An abnormal condition of the blood is liable to cause a murmur, *e.g.*, anæmia. *6.* Excited cardiac action may render the sounds rough and murmur-like. Murmurs have been appropriately divided into *organic* and *inorganic*, according as they are associated or not with positive organic mischief. The latter will be presently alluded to separately.

CHARACTERS OF MURMURS AT THE ORIFICES.—Theoretically there may be two murmurs in connection with each of the four chief orifices of the heart, one indicating *obstruction*, the other *regurgitation*; but only *mitral* and *aortic* murmurs are usually met with, those associated with the *tricuspid* and *pulmonary* orifices being exceptional.

1. Mitral Murmurs.—These are loudest over or just above the apex-beat, being conducted more or less round the left side in an outward direction, and also heard to a variable extent upwards towards the base. *1. Regurgitant.* Systolic in time, this murmur is generally of medium or low pitch, but varies much in its other characters; it may be so loud as to be heard extensively over the chest, but is not often distinct at the base of the heart, and in many cases becomes abruptly fainter on passing the stethoscope in this direction. It is commonly well-conducted directly backwards round the left side, being perceptible behind in the left vertebral groove, or even sometimes in the right, especially between the sixth and ninth dorsal vertebræ. The exact direction of conduction of this murmur is supposed to indicate which flap of the valve is mainly involved, the aortic flap being implicated if the murmur takes the direction of the axilla, the outer flap if it is conducted away to the left of the nipple. *2. Obstructive or constrictive.* Usually an obstructive mitral murmur is post-diastolic or præ-systolic, being entirely a new sound, and having no connection with the normal diastolic sound. In some cases, however, it seems to begin almost simultaneously with this sound, and to continue through the entire interval. Its explanation is as follows:—As soon as the ventricle ceases to contract the mitral valves fall back, and the orifice becomes patent. The blood which has collected in the auricle quietly passes through for a while; but finally the auricle, being distended, suddenly contracts, and drives on the blood with some force through the mitral opening, this being immediately followed by the ventricular systole. It

is at the time of this auricular contraction that the murmur is usually perceived, and hence it has been called "auriculo-systolic." If, however, there is considerable constriction, with much thickening and roughness about the opening, it may be heard during the whole of the period that the blood is passing through. Hence the length of this murmur varies, but it is usually rather short. Its intensity is not very great as a rule, but even when loud the extent of its conduction towards the axilla is much less than that of the regurgitant murmur, it being, indeed, often confined to a very limited area, while it is only very exceptionally heard in the back. It seems, however, to be more conducted towards the right than the systolic murmur. The pitch is low, and quality almost always harsh, sometimes very much so, being almost grating. Dr. Hilton Fagge describes it as churning or grinding. It is followed by a very short and sharp systolic sound, often mistaken for the second sound.

II. Aortic Murmurs.—1. *Obstructive.* Most marked at the base of the heart, generally over the sternum and in the contiguous portion of the second right space, an aortic obstructive murmur is conducted mainly upwards and to the right, but also to some extent down along the sternum and towards the left apex, though it is not often heard at this point. Behind it is audible in the left vertebral groove, usually from about the second or third to the sixth or seventh dorsal vertebra, but sometimes it can be heard all along the dorsal region and even on the right side. I have met with several instances in which the murmur was so loud as to be heard over the chest and back extensively, as well as for a considerable distance along the main arteries. It is generally prolonged and of moderate pitch, occasionally musical; it may be very harsh or even rasping. 2. *Regurgitant.* This murmur is usually loudest over the sternum, opposite the third space or fourth cartilage, being conducted chiefly downwards along the sternum, so that it is very distinct at its lower end, where it generally abruptly ceases. Towards the right infra-clavicular region it is not nearly so well-conducted as the obstructive murmur, and it is rarely heard in the back. Occasionally it is audible at the apex of the heart. Its rhythm is diastolic, it being, in fact an altered second sound; but the murmur is always prolonged more or less into the interval, and may fill it completely. Indeed its duration is often so considerable as to lead to its being mistaken by the inexperienced for a systolic murmur, even when both exist together. Commonly it is of blowing quality, not harsh, and of medium or high pitch; but its characters are variable.

III. Tricuspid Murmurs.—These are heard at the right apex, *i.e.*, over the junction of the xiphoid cartilage and sternum, being conducted a little upwards and to either side. 1. *Regurgitant.* Regurgitation is common at the tricuspid orifice, but as this is due to mere enlargement of the opening, there being no roughness or thickening of the valves, and as the right ventricle does not act powerfully, a murmur is only heard in exceptional instances. When present, it is systolic, faint, and of low pitch. 2. *Obstructive.* This is a mere curiosity, but theoretically it would be præ-systolic in time.

IV. Pulmonary Artery Murmurs.—These are audible at the left base, about the second space and third cartilage or space near the

sternum, and are conducted upwards and to the left, so that they are well heard under the left clavicle. As in the case of the aorta, two murmurs may be met with, viz.:—1. *Obstructive* or *systolic*. 2. *Regurgitant* or *diastolic*. Of the former several instances have come under my notice; the latter is extremely rare.

CONDITIONS INFLUENCING MURMURS.—Without entering into particulars, it must suffice to state that murmurs may be modified as regards their intensity, seat, direction of conduction, and other characters by:—1. Deformities of the chest. 2. Posture. 3. Morbid conditions external to the heart, for example, emphysema, pleuritic effusion, lung-consolidation. 4. The state of the walls and cavities of the heart, as regards hypertrophy, dilatation, or degeneration. 5. The force and regularity of the cardiac action. 6. The presence of two murmurs at the same orifice. 7. The existence of two synchronous murmurs at different orifices.

INORGANIC MURMURS.—A brief summary may be given here of the inorganic cardiac murmurs which may be met with. 1. *Anæmic*. This has usually the characters of a faint pulmonary systolic murmur, somewhat blowing or whiffing in quality. It may, however, be aortic, and some have even localized it in the tricuspid or mitral orifice. Excited action of the heart; pressure with the stethoscope; and the erect posture intensify an anæmic murmur. The chief theories of its causation are that it is due entirely to the abnormal state of the blood; to pressure upon the vessel by the stethoscope; or to unusual vibration of the walls of the artery or its valves, in consequence of their relaxed condition. Probably all these conditions may aid in its production. 2. A murmur may result from *irregular action of the muscoli papillares* in the left ventricle. Of the nature of a slight, or occasionally of a tolerably marked, though inconstant mitral regurgitant murmur, this is usually associated with chorea, but may depend upon a very feeble or irregularly-acting heart. 3. *Excited cardiac action* or *irregular palpitation*, especially if associated with enlargement of the heart, may cause the first sound to become rough and murmur-like, particularly at the base. 4. *Twisting of the heart* may give rise to a basic systolic murmur. 5. *External pressure* generally leads to an aortic obstructive murmur, but occasionally it is seated at the pulmonary orifice. 6. Murmurs due to *clots in the heart* are usually systolic, and connected with the right orifices.

(C.) PERICARDIAL SOUNDS.

I. Pericardial murmurs, or Friction-sounds. A pericardial friction-sound depends upon the rubbing together of roughened surfaces of the pericardium during the cardiac action. The roughness may be due to excessive vascularization; exudation or its remains; coagulated blood; or tubercle or cancer.

CHARACTERS.—In the following description of a *pericardial friction-sound*, the differences between this sound and an *endocardial murmur* will be evident. 1. Its *seat* and *extent* are very variable, depending upon those of the physical conditions necessary for its production, but frequently its point of greatest intensity does not correspond to that of

any endocardial murmur; while it is usually abruptly limited even when loud, and is not conducted in the directions characteristic of endocardial sounds. 2. It appears distinctly *superficial* as a rule. 3. Great variety is observed as regards the *intensity, quality, and pitch* of a friction-sound. Usually it is more or less *rubbing* and *rough* in quality, but may be clicking, creaking, or grating, and Walshe describes churning and continuous-rumbling varieties, due to the presence of fluid.* It may differ over different parts of the cardiac region. 4. The *rhythm* may be systolic, diastolic, or both, but very often it is irregular, not corresponding exactly to either, and varying with each beat of the heart. A double murmur of maximum intensity at the same spot is considered very characteristic of pericardial origin. In many cases the heart-sounds may be heard quite distinctly through the friction. 5. Pressure with the stethoscope frequently materially modifies a pericardial murmur, by increasing its area or intensity; altering its rhythm; raising its pitch; or rendering it rougher in quality. 6. Bending the body forwards is said to intensify pericardial friction, but this is not reliable. It may disappear in the sitting posture; and a change in position may affect that of the murmur, should fluid be present in the pericardium. 7. A quick inspiration in some cases intensifies friction-sound, and raises its pitch. 8. Rapid changes are liable to take place during the progress of the case, as regards the site, extent, rhythm, and characters of a pericardial murmur.

It is necessary to mention that pericardial rubbing may be simulated by pleuritic friction, modified by the cardiac action. Its situation, which is generally about the left border of the heart; marked irregularity; and cessation when the breath is held, will usually serve to distinguish the latter.

2. A **pericardial splashing-sound** has been described, developed by *succussion*, and due to the presence of air and fluid in the sac, but it is extremely rare.

B. EXAMINATION OF THE ARTERIES.

In directing physical examination to the arterial system, it is well to attend first to the great vessels of the chest and neck; and afterwards to the arteries of the limbs, especially the brachial and radial.

(A.) EXAMINATION OF THE ARTERIES OF THE CHEST AND NECK.—The chief abnormal conditions which may be observed in connection with these vessels may be thus summarized:—

I. **Local bulging**, which may be caused by aneurism.

II. **Changes in the amount and characters of pulsation.**

1. *Excessive pulsation* may be associated with:—*a.* Excited action of the heart. *b.* Hypertrophy of the left ventricle. *c.* Aortic regurgitation, which is also characterized by an immediate subsidence of the arteries. *d.* An atheromatous condition of the vessels. *e.* Aneurisms of various kinds, which present a limited impulse, usually *expansile* and *heaving*. 2. In cases of mitral regurgitation there is sometimes almost an entire *absence of pulsation* in the carotids and subclavians, even when the heart is much hypertrophied and is acting powerfully.

III. Thrill. Arterial thrill may depend upon:—1. Anæmia. 2. External pressure. 3. Diseased vessels and aneurisms, especially general dilatation, accompanied with atheroma or calcification. A thrill may be felt in the suprasternal notch, owing to the aorta being thus affected.

IV. Abnormal dulness and resistance. The only morbid condition of an artery which can give rise to this physical sign is an aneurism.

V. Murmurs. An arterial murmur is usually nearly synchronous with the cardiac systole. Its causes are:—1. Pressure by the stethoscope, particularly if this is applied over the third part of the subclavian, which may originate a murmur even in health, but especially in connection with hypertrophy of the heart, aortic regurgitation, or anæmia. The anæmic murmur is usually very easily produced; of high pitch, and blowing, whiffing, or whizzing quality; and may be heard extensively along the arteries. 2. Pressure by a tumour, enlarged glands, or fibrous thickening and adhesions. One of the best examples of this mode of causation is the subclavian murmur heard above or below the left clavicle in some cases of phthisis. 3. Roughness of the inner surface of an artery, due to atheroma, calcification, erosion, exudation, or fibrinous coagula. 4. Change in the form of an artery, viz., aneurism, in which the murmur may be systolic, diastolic, or both; and coarctation. 5. Abnormal communication between a large artery and vein, such as between the aorta and superior vena cava.

(B.) EXAMINATION OF THE ARTERIES OF THE LIMBS.—The brachial artery, just above the bend of the elbow, affords the best indications as to morbid states of the arterial system generally, especially atheroma and calcification. On bending the elbow the vessel is then distinctly visible and tortuous, presenting a vermicular motion with each pulsation; while it feels more or less hard and rigid, full, incompressible, and rolls like a cord under the finger.

The pulse.—Usually the radial artery at the wrist is made use of for observing the characters of the pulse, but it is often advantageous to attend to other arteries, such as the brachial, temporal, or carotid, and when investigating local conditions special vessels must of course be examined. The methods of examination are by *inspection*, *palpation*, and the use of the *sphygmograph*; and the points to be noticed with regard to the pulse include:—*a.* Its *visibility* or *invisibility*; *b.* *Frequency*; *c.* *Quickness* (sharp, abrupt, slow); *d.* *Volume* (large, full, small, thready); *e.* *Force*, and *degree of resistance* or *tension* (strong, weak, extinct; soft, hard; compressible, incompressible; equal, unequal); *f.* *Rhythm* (regular, irregular, intermittent, lagging behind cardiac systole, continuous); *g.* *Special characters*, both to sight and touch (rigid, tortuous, bounding, hammering, jerky, undulating, with sense of sudden subsidence, vibrating or thrilling, tremulous, dicrotic, or reduplicate). The term *dicrotic*, when applied to the pulse as felt by the finger, implies that this has a sensation of being doubled; now, however, it possesses a special significance, as indicating a peculiar character of the pulse brought out by the sphygmograph. *h.* *Sphygmographic tracings.* *i.* The effects of *change of posture*; and *comparison*

of the characters of the pulse *on opposite sides*. The points last mentioned are only required to be noted in exceptional cases.

THE SPHYGMOGRAPH.—For more complete information respecting this instrument reference must be made to the standard physiological works, and to the writings of Marey, Burdon-Sanderson, Anstie, B. Foster, Mahomed, and others on the subject. The sphygmograph must be seen in order to be properly understood, but it may be stated here what it essentially consists of. An elastic steel spring, of sufficient strength, is provided on the under-surface of one end with a convex piece of ivory, which is placed over the artery, the other end being fixed to the framework of the instrument. By a certain arrangement the movements produced in this spring by the pulsation of the artery are transmitted to a narrow lever moving on a pivot, and long enough to amplify them considerably. At the free extremity of this lever is a little pen, made of flexible metal, which traces the motions either on a piece of glazed paper by means of ink or on smoked glass. This paper or glass is made to travel quickly and steadily in a definite direction, by the aid of an apparatus with clock-work, which is wound up, and the plate can be started or stopped at will by a regulator. As it passes along, the pen traces upon its surface the movements communicated from the pulse through the spring.

A sphygmographic tracing is generally taken over the radial artery, the apparatus being fixed on the front of the fore-arm, with the end of the spring over the artery near the wrist, and being kept in its place by elastic bands passing round the fore-arm, the back of which rests on a pad. It is no easy task at first to fix the instrument so that the pulsations are rendered evident, and to regulate the pressure on the artery so that it shall not be too great or the reverse, and that thus the movements may be made visible in their maximum degree; this regulation is effected by means of a screw, and is a matter of much importance.

Description of a sphygmographic tracing. The entire tracing, of which Fig. 1 is intended to give a general idea, is made up of a series of



FIG. 1.—SPHYGMOGRAPHIC TRACING.

curves or pulsations, each of which corresponds to a complete revolution of the heart's action. It is necessary first to study the characters of an individual typical curve. It may be described as consisting of a *systolic* and *diastolic* part, corresponding respectively to the period of contraction and dilatation of the ventricle; or it may be divided into:—*a. Line of ascent; b. Summit; c. Line of descent*, in which may be observed two or sometimes three secondary waves, with intervening notches, named *first or distension wave; second or great wave, or true diastolic*; and *third*, which lies between the other two, but is usually absent. In order to explain these different parts, it is necessary to

point out certain facts in the physiology of the circulation, of which the sphygmograph has given far more accurate knowledge than was previously possessed; and to indicate their relation to the various parts of a pulse-curve. It will be well to take them in the order in which they occur, illustrating them by Fig. 2. 1. The left ventricle contracts more or less suddenly, opening the aortic valves, which give an impulse to the blood in the arteries; thus is produced the *line of ascent, summit-wave, or percussion-impulse* (*a* to *b*). 2. After this sudden vibration the arterial walls partially collapse, which is indicated by the first part of the line of descent, ending in the *first notch* (*b* to *c*). 3. A wave of blood next passes out of the heart into the aorta, and this gives rise to the *first secondary wave, wave of distension or systolic pressure* (*c* to *d*). 4. After this there is a reflux of blood towards the heart, by which the aortic valves are closed, which corresponds to the portion of the line of descent from *d* to *f*, ending in the *great or aortic notch* (*f*). 5. During this reflux a vibration may occur, originating the *third secondary wave* (*e*), which is placed as it were in the aortic notch, and which, as already stated, is generally wanting. 6. The aortic valves are then suddenly closed by the pressure of the reflux current of blood, and this accounts for the *great secondary wave or true dicrotism* (*f* to *g*).

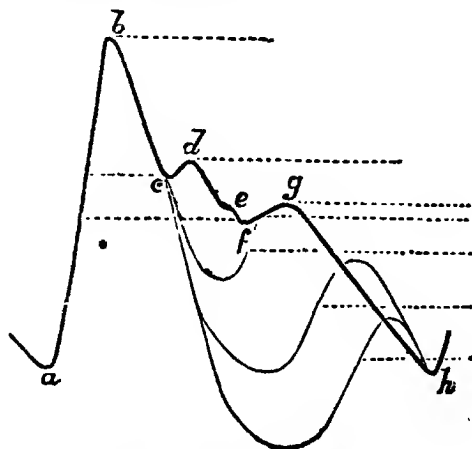


FIG. 2.—ENLARGED SPHYGMOGRAPHIC CURVE.

7. Finally, the blood flows onward in the vessels, this corresponding to the remainder of the line of descent (*g* to *h*); after which the ventricle again contracts, and the same series of phenomena is repeated.

It will be evident on studying this description, that the systolic portion of the curve extends from the beginning of the line of ascent to the bottom of the aortic notch (*a* to *f*), during which the ventricle is either contracting or contracted; the rest of the line of descent corresponding to the diastole.

In observing a sphygmographic pulse-tracing, the following are the particulars to be noted:—1. The number of the pulsations on the tracing, which gives the exact frequency of the pulse. 2. With regard to each curve:—*a*. the length of the line of ascent, and whether it is vertical or more or less oblique; *b*. the shape of the summit, whether

acute, rounded, or square; *c.* the number, size, and position of the secondary waves; *d.* the direction and length of the part of the line of descent beyond the aortic wave, and 'if there are any undulations in it. 3. The relative characters of the curves in a tracing, especially their height and depth, observing whether their summits and bases are on the same level or not, which may be determined by drawing a horizontal line along the top and bottom of the tracing, these being respectively the lines of the greatest and least arterial tension. In this way the regularity or irregularity of the pulse is determined with precision.

The conditions which chiefly modify the sphygmographic tracing are:—1. The rapidity and force of the ventricular contraction. 2. The degree of arterial tension or resistance, which is influenced by the condition of the walls of the vessels; the controlling effect of the nerves upon them; and the degree of difficulty in the onward passage of the blood, either in the distal part of the artery itself, or through the capillary circulation. 3. The quantity of blood sent into the vessels, which is to some extent dependent upon the duration of the interval between the pulsations, as, if this is long, the blood flows onward, and thus the quantity in the arteries is diminished, and the pressure lessened. 4. The volume of the artery. 5. The condition of the aortic valves.

The more rapidly the ventricle contracts, the more vertical will be the line of ascent, while the height of this line is in proportion to the force of contraction. If the ventricle is acting feebly the summit assumes a rounded form. High arterial tension tends to diminish the height of the line of ascent, and to render it more sloping; to make the first secondary wave proportionately more developed, and to raise it until it ultimately becomes blended with the apex, making this round or square; to obliterate all minor waves; to lessen the aortic wave: and, if there is obstruction to the onward passage of the blood, to make the remainder of the line of descent slightly convex upwards, and to shorten it. Low tension produces the opposite effects, and is often attended with vibratory undulations in the line of descent, it being only when this condition exists that the third secondary wave is observed.

A healthy pulse-curve presents a line of ascent nearly vertical and of moderate height; an acute summit; and a gradual descent, usually only interrupted by the distension and aortic secondary waves. This form of pulsation is sometimes called *tricrotous*, because it has three waves. It must be remembered that physiological variations of the pulse-tracing will arise from taking food or alcohol, over-exertion, external heat, strong emotion, and other causes.

Certain terms are used in describing sphygmographic curves, which it is requisite to notice. When the first secondary wave is absent or nearly so; the aortic notch deep (owing to the closure of the valves being delayed), so that it is on a level with the base of the curve; and the aortic wave prominent, the pulse is called *dicrotous*. (See Fig. 2.) It indicates very low arterial tension. A minor degree of this variety is named *hypo-* or *sub-dicrotous*. A greater degree, so that the aortic notch sinks below the level of the curve basis, the aortic wave forming part of the line of ascent of the next pulsation, is termed *hyper-dicrotous*. *Monocrotous* signifies that there is only the primary wave; and *polycrotous*, that there are a number of undulatory vibrations.

Uses of the Sphygmograph in disease. Undoubtedly the sphygmograph gives much more exact and accurate information with regard to the circulation than can be obtained by merely feeling the pulse, especially with respect to the action of the heart and the degree of arterial tension, while it reveals irregularities and inequalities which cannot otherwise be detected. It is employed for purposes of diagnosis and prognosis, and for indicating treatment. Its *diagnostic* value has, by different observers, been advocated in aortic disease, especially regurgitation; cardiac hypertrophy; degeneration of arteries; capillary disease associated with degenerative processes in tissues; renal disease; and aneurisms, in connection with which it is necessary to compare the pulses on the two sides. The characteristic features will be pointed out under the several diseases.

For *prognostic* and *therapeutic* indications the tracings obtained by the sphygmograph are useful in fevers and other acute diseases, such as delirium tremens, pericarditis, or pleurisy, especially by comparing them with the temperature. Among the principal dangerous signs are a marked dicrotous, hyper-dicrotous, or monocrotous pulse; great inequality and irregularity of the tracings; or a small curve, the ascent being short and not vertical, with a rounded or square summit.

C. EXAMINATION OF THE VEINS.

The veins, from the examination of which most information may be gained, are those of the neck, and the superficial veins of the chest. In many cases it is also useful to observe the superficial veins of other parts, especially those of the abdomen and legs. When examining the veins of the neck, special attention should be paid to the right external jugular, and to the venous sinus at the junction of the subclavian and internal jugular. The following are the important abnormal signs which may be noticed in connection with these vessels:—

I. Enlargement. It is necessary to observe the degree of the dilatation; whether it is permanent or variable; and if the vessels are knotted or varicose. *Causes.* 1. Tricuspid regurgitation. 2. Obstruction of the superior vena cava, innominate, or a more local vein, owing to pressure by a tumour or some other morbid condition; or internal plugging by a thrombus. 3. An aneurism communicating with a large vein within the thorax.

II. Excessive distension of the veins of the neck after a cough. During the act of coughing the veins of the neck always fill more or less, but when they are dilated and their valves are inefficient, they become much more distended than usual, and the degree of imperfection in the valves may often be thus indicated.

III. Pulsation, and filling from below. Some observers affirm that these characters can be seen in the large veins of the neck even in healthy persons, but at any rate they are then scarcely appreciable. In order to realize them satisfactorily, the patient should assume a recumbent posture, with the head low. Generally pulsation can only be seen, but when very powerful it may also be felt. Care must be taken not to mistake transmitted arterial impulse for venous pulsation. In order

to detect *filling from below*, it is requisite to press upon the *right external jugular vein* near the clavicle, and then draw the finger up the neck along its course, keeping up the pressure; the vein usually fills in jerks.

Causes. 1. Tricuspid regurgitation alone may lead to pulsation, but usually this is soon associated with—2. Inefficiency of the valves of the veins, which renders the pulsation more marked, and which must exist before there can be any filling from below. 3. Right hypertrophy considerably intensifies venous pulsation. Venous pulsation in connection with the liver is occasionally noticed, to which special attention has been drawn by Dr. Frederick Taylor.

IV. Venous thrill. A thrill is in very exceptional instances felt in connection with the veins of the neck. It may accompany the pulsation just mentioned; or may be due to extreme anæmia.

V. Venous murmurs. 1. *Venous hum*—“*Bruit du diable*.” This is the only venous murmur which is at all likely to be met with, and it is very common in cases of marked anæmia. Best heard at the junction of the right internal jugular and subclavian, especially on twisting the neck a little to the left, this murmur may, however, be extensively diffused along the veins. It is continuous and uninterrupted, though not uniform in its intensity; of variable quality, such as humming or musical, blowing, buzzing, rushing, or whistling. Inspiration, pressure, and the erect posture intensify the venous hum; while it is loudest during the ventricular systole, being in proportion to the force and rapidity of the current of blood. 2. *Intermittent venous murmurs* have been described, associated with tricuspid regurgitation, hypertrophy of the right heart, and other morbid conditions, but they must be extremely exceptional.

CHAPTER II.

FUNCTIONAL DISORDERS OF THE HEART.

I. ANGINA PECTORIS—SUFFOCATIVE BREAST-PANG.

ÆTIOLOGY AND PATHOLOGY.—There has always been much difference of opinion and discussion as to the explanation of the symptoms which characterize an attack of angina pectoris, and as to the condition of the heart during the paroxysm. Formerly the complaint was regarded as of neurotic origin, due to some disturbance of the cardiac plexus, leading, according to one view to spasm, according to another view to paralysis of the walls of the heart. That some cases of angina are due to such disturbance is unquestionable, and this is borne out by experiment, as well as by clinical and pathological observation. It may thus arise from intrinsic disorder of the excito-motor cardiac nervous system; from direct irritation of the cardiac branches of the vagus; or from reflex excitement, especially due to irritation in connection with the abdominal organs. The pathology of the majority of cases of true angina pectoris is at present, however, differently explained. It is

supposed that it arises from general vaso-motor spasm, due to increased stimulation of the vaso-motor nerve-centre, which leads to spasmodic contraction of the vessels, and this causes acute distension of the left cavities of the heart, which consequently are embarrassed and act with difficulty, being unable to empty themselves perfectly. During a paroxysm there is marked rise in blood-pressure, with increased tension, as was first shown by Dr. Lauder Brunton by the aid of sphygmographic tracings. Should an attack prove fatal, the heart will stop acting in a state of full distension, and at post-mortem examinations it is generally found flaccid rather than rigidly contracted. Dr. Gairdner suggests that the condition is aggravated by cardiac anæmia, due to vaso-motor spasm of the smaller arteries in the heart itself. Therefore true angina pectoris is part of a morbid process, and not a disease of the heart *per se* (Fothergill).

In the large majority of cases angina pectoris is associated with some previous disease of the heart or pericardium, and some change in the nutrition of the organ has always been found in fatal cases. The morbid conditions which have been most commonly observed are extensive atheroma or calcification of the coronary arteries; fatty degeneration of the heart; and flabby dilatation. Anginal attacks do, however, no doubt occur in persons in whom the heart is healthy, and these are the cases in which there is comparatively little danger, the organ being capable of recovering from the sudden distension to which it is subjected; the danger increases in proportion to the extent of structural degeneration of the cardiac walls.

With regard to the *exciting causes* of an anginal attack, it can seldom at first be attributed to any obvious cause except undue bodily exertion. The first paroxysm has been said to set in generally while the patient is walking up a hill, against the wind, after a meal, and especially after breakfast. Not uncommonly subsequent attacks come on after the first sleep at night. Sudden or powerful agitation, and various forms of emotion may bring on a paroxysm. Exposure to external cold is not an uncommon cause, owing, as it is supposed, to its producing contraction of the cutaneous capillaries. Anginal seizures may also arise from reflex disturbance in connection with the abdominal organs, as from heavy meals, indigestible food, or dyspepsia. One form may depend upon direct irritation of the cardiac nerves by growths.

Certain distinct *predisposing causes* have been made out, namely, the male sex, probably because men are more subject to lithiasis; advanced life, true angina being rarely observed under 45 to 50 years of age; and a high social position. Several eminent men have died from this complaint. It is believed to be connected with the gouty diathesis, and imperfect anginal attacks are frequently observed in gouty persons, also occurring comparatively early in life in individuals whose fathers have died of angina (Fothergill).

SYMPTOMS.—An attack of angina pectoris comes on as a rule with abrupt suddenness, but warnings of its approach are occasionally present, in the way of curious sensations or slight pain about the cardiac region.

The chief symptom is an intense pain in some part of the præcordial region, generally referred to mid-sternum, which may amount to the

most excruciating torture. In character it is described as shooting, plunging; tearing, aching, gnawing, sickening, or burning, but it is often indescribable. At the same time a feeling of oppression or constriction is experienced across the chest, as if it were being forcibly compressed and could not be expanded, attended with a sense of suffocation and inability to breathe, though this act is not really interfered with, and there is not the least indication of cyanosis. If a deep breath can be taken and held, this may relieve the pain. Usually no tenderness is felt, but pressure rather gives relief, though occasionally tenderness over the sternum and adjoining spaces is complained of. Frequently painful sensations shoot from the cardiac region in various directions, especially down the left arm, or, in exceptional instances, the right, even to the fingers, in which there may be sensations of tingling or numbness; upwards along the left side of the neck; directly backwards; or round the side. This is due to the connection of the cardiac with the cervical and first dorsal nerves.

These symptoms are accompanied with signs of grave general disturbance. The face becomes pale, sunken, and covered with cold sweat; while the expression is indicative of the intense anxiety, alarm, and dread of impending death which the patient feels. In most cases the pulse tends to become feeble, and even fluttering or irregular if the attack is prolonged, though at first there is increased tension. The general surface is often pale, cold, and dry; and the patient may feel general chilliness, with chattering of the teeth. Much will depend on the condition of the heart with which the angina is associated, which also necessarily influences the *physical signs*. Occasionally vomiting and eructations accompany the attack. The patient is quite conscious at first, but in prolonged or fatal cases may fall into a state of syncope, and spasmodic movements or even general convulsions may be observed.

Usually an entire attack is made up of several brief paroxysms with intermissions, but there may be only one; the morbid sensations generally cease suddenly, this being attended with a sense of extreme relief, though a feeling of exhaustion is afterwards experienced, which may last for some time. Very rarely does the first attack prove fatal, but it may thus terminate, either suddenly or gradually. Probably some cases of sudden death are due to angina. A marked character of the complaint is its great tendency to recur under the influence of very slight exciting causes.

A form of angina pectoris is described, which is not attended with pain—*angina sine dolore*. Here also an affection may be alluded to, named *pseudo-angina pectoris*, which is probably of a neuralgic character, and is met with mainly among young persons, being characterized by sudden pain and unpleasant sensations about the heart, palpitation, disturbance of breathing, faintness and giddiness, pallor of the face, and feeble pulse. The condition of the patient may appear to be really serious, but very rarely does a fatal termination happen. This complaint is chiefly observed in connection with anæmia; various nervous disorders, especially hysteria; or blood-diseases, such as gout. Females are most commonly affected, and it is not infrequent in connection with the menopause. It may also arise from undue exercise after a full meal.

PROGNOSIS.—True angina pectoris is a very dangerous condition, but the false variety is not, therefore it becomes important to distinguish between them. The presence and nature of any organic cardiac lesion will necessarily influence the prognosis materially, and this can only be determined by physical examination. Age has also an important influence on the prognosis, being more serious the older the patient is.

TREATMENT.—1. In order to *prevent attacks*, any one who is subject to angina should avoid every possible exciting cause, and it is desirable that he should carry some remedy in his pocket, especially nitrite of amyl or opium, so that it may be made use of immediately the least indication appears of the approach of a paroxysm. 2. *During an attack* any obvious source of reflex disturbance, such as indigestible food, must be at once removed. The internal remedies usually given are *sedatives*, *antispasmodics*, and *stimulants*, especially opium in full doses, hydrate of chloral, the various ethers, chloroform, spirits of ammonia, musk, camphor, and hot brandy-and-water. Digitalis and belladonna are very useful in some instances, when the cardiac action is much disturbed. *Inhalations* of chloroform or ether, or, still better, of nitrite of amyl, should be resorted to with due care in severe cases. Nitrite of amyl has been found especially valuable, giving marked relief, and speedily cutting short paroxysms of angina. Patients are in the habit of carrying this remedy about with them, so that it may be used at the first threatening of an attack. Recently the internal administration of nitro-glycerine has been recommended in minute doses. *Local applications*, such as dry heat with friction, sinapisms, or friction with chloroform or belladonna liniment may at the same time be employed. The use of the constant current has also been recommended. Dr. Gairdner advocates warm mustard pediluvia, with heat applied to the arms and thorax. In a gouty person the joints of the feet should be irritated. 3. *During the intervals* the treatment indicated is that which applies to cardiac affections in general, in the way of regulating the diet and digestive organs; attending to the general and constitutional condition, as well as to the heart and the state of the blood; and to all hygienic matters. Gout must be especially attended to. Tepid or cold baths followed by friction, and change of air and scene, are often beneficial. A belladonna plaster should be worn constantly over the cardiac region.

For *pseudo-angina* similar remedies are indicated during a paroxysm, but they need not be so powerful. At other times the treatment must be directed to the cause of the complaint, and the condition of the patient.

II. SYNCOPE—FAINTING.

The phenomena associated with syncope are due primarily to failure in the action of the heart; which is speedily followed by symptoms resulting from anæmia of the nervous centres; these being succeeded by failing pulmonary functions.

ÆTIOLOGY.—The chief *predisposing causes* of syncope are early adult age; the female sex; a nervous temperament; and general weakness, with an impoverished condition of the blood.

Exciting causes. Some of the causes now to be mentioned seem to

lead to a condition allied to "shock," in which the three chief systems appear to be almost simultaneously affected, though probably the nervous centres are first disturbed; and it is not always easy to determine whether a case should be reckoned as one of syncope or shock. They may be arranged under the following heads:—1. *Want of blood in the cavities of the heart*, from rupture of its walls or of a great vessel, or any form of severe hæmorrhage; obstruction in the principal veins; or sudden removal of pressure from the great vessels, as when syncope follows tapping for ascites. 2. *Inadequate supply of blood to the cardiac walls*, as from obstruction of the coronary arteries; or a supply of impure blood, as in low fevers, or when a syncopal attack comes on in a hot and crowded room. 3. *Partial or complete paralysis of the muscular tissue of the heart*, either from some organic change; or from nervous disturbance, either centric, reflex, or intrinsic in origin. Numerous causes of syncope act in this way, such as fatty and other degenerations of the heart, flabby dilatation, or simply a weak state of this organ in certain chronic diseases, *e.g.*, cancer or phthisis; sudden reflux of blood in aortic regurgitation; various poisonous substances, *e.g.*, aconite, tobacco, prussic acid, antimony; violent emotions; severe cerebral lesions; long continuance in a warm bath; reflex disturbance from bad smells or unpleasant sounds; pain of any kind; extensive burns; the passage of a catheter; a shock to the sympathetic trunk, as from a blow in the epigastrium; drinking cold water when the body is heated; taking indigestible food; or over-eating after fasting. Lightning sometimes kills in this way. 4. *Continued spasmodic contraction of the heart*. 5. *Mechanical pressure upon the heart from without*, as in some cases of extreme pericardial effusion.

ANATOMICAL CHARACTERS.—The state of the heart varies considerably according to the cause of the syncope. After great loss of blood it is usually contracted and empty. When the walls are paralyzed, the cavities are dilated, and contain more or less fluid or coagulated blood. The lungs are usually anæmic, and the nervous centres markedly so.

SYMPTOMS.—Syncope may come on quite suddenly, or may even cause instantaneous death. In many cases, however, it is gradual in its onset, there being premonitory symptoms, differing in different cases, before actual insensibility occurs. These are a sense of faintness, giddiness, and trembling, with sinking in the epigastrium, nausea, or sometimes vomiting; pallor, especially of the face, with drawn features; chilliness and shivering, or in some cases a sense of heat, there being at the same time cold, clammy perspirations; a very rapid, small, and weak pulse, tending to become irregular and slow, though the large arteries may throb; hurried, irregular, or gasping breathing, often attended with sighing; great restlessness, and occasionally slight convulsive movements; mental confusion; and disturbance of the senses of sight and hearing, indicated by more or less dim vision, extreme sensibility to light, and noises in the ears. When the syncopal state is established, the symptoms are absolute insensibility, with dilatation of the pupils; death-like pallor, with cold and clammy sweats; a slow and extremely weak, irregular, or actually imperceptible pulse; infrequent and irregular respiration, which may ultimately cease altogether. Not uncommonly convulsive movements are observed, and the sphincters may be relaxed,

with involuntary discharge of fæces and urine. Examination of the heart reveals feebleness or complete absence of the cardiac impulse and sounds, especially the systolic sound.

The syncopal condition lasts a variable time, and either ends in death or recovery. In the latter case very uncomfortable sensations are usually experienced as the patient is restored to consciousness, this being often attended with palpitation, vomiting, or convulsive movements.

TREATMENT.—1. Any obvious reflex cause of syncope should be at once removed. 2. It is most important to attend to the posture of the patient, which should usually be horizontal, with the head low. Fainting may not uncommonly be prevented by bending forwards, and hanging the head down between the knees as far as possible. 3. All clothing should be loosened about the neck and chest, and plenty of fresh air admitted. 4. The application of ammonia to the nostrils; dashing cold water in the face; or friction along the limbs and over the heart, either with the hand alone or with some stimulating liniment, will often restore vitality. 5. The internal administration of *stimulants*, such as brandy, wine, ammonia, ether, or musk, is most useful, and if these agents cannot be swallowed and there is evident danger, stimulant enemata should be employed. 6. Attempts may be made to confine the blood to the central organs, by making pressure on the arteries of the limbs by the aid of the fingers or tourniquets, warmth being maintained in the parts thus deprived of blood by means of hot bottles and friction. 7. Sinapisms or turpentine stupes over the heart should be employed if necessary; and in dangerous cases regulated galvanism along the pneumogastric nerves, artificial respiration, and transfusion are the most potent remedial means available. The last is particularly valuable if the syncope is due to great loss of blood.

III. PALPITATION.

ÆTIOLOGY.—Palpitation occurs under a variety of circumstances, but it is always a sign of one or other of the following conditions, which affect the action of the heart, viz.:—1. Muscular failure. 2. Laborious effort to overcome some impediment; or in consequence of the organ having to act under a physical disadvantage. 3. Nervous excitement. 4. Nervous exhaustion. The nervous disturbance may be intrinsic in the heart itself, or of centric or reflex origin.

Exciting causes. These may be arranged as follows:—1. *Acute or chronic organic diseases of the heart or pericardium.* These may induce palpitation either because the muscular tissue is involved, the cardiac action being thus more or less impaired; or because there is some obstruction to the circulation at one or other of the orifices, which the heart cannot overcome. When palpitation accompanies hypertrophy, it is presumed to be due to the fact that this is insufficiently compensatory, and it may indicate commencing degeneration of the heart-substance. 2. *Mechanical interference with the cardiac action*, as from tight lacing; distorted chest; displacement by pleuritic effusion; or abdominal enlargements, of which flatulent distension of the stomach is a common form. 3. *Obstruction in the vessels*, either from a diseased

condition of their walls or high arterial tension, in connection with vascular spasm, atheroma or calcification, or Bright's disease. 4. *Chronic affections of the lungs which interfere with the circulation*, such as bronchitis and emphysema. 5. *Some abnormal state of the blood*, either as regards its quantity or quality, e.g., plethora or anæmia; the condition associated with gout, renal disease, or fevers; and, probably, the admixture of materials introduced into the system from without. There is a difficulty in driving on the blood under these circumstances, and thus the heart becomes easily disturbed, while at the same time its own tissue is supplied with impure blood. 6. *Causes acting through the nervous system*, for example, prolonged cerebral excitement or undue mental labour; emotion; functional nervous disorders (hysteria, epilepsy, chorea); the abuse of tea, alcohol, or tobacco; reflex disturbance originating in the alimentary canal, as from eating indigestible food, or in connection with the genital organs. The view has been advanced that nervous palpitation is chiefly due to spasmodic contraction of the arterioles, whereby a difficulty in the passage of the blood is induced; no doubt, however, the innervation of the heart itself is disturbed.

In some cases palpitation is present at all times more or less, though in such instances it tends to be aggravated by anything which throws extra work upon the heart, such as slight exertion. In other instances it occurs only in paroxysms, which are brought on by some evident exciting cause, or independently of any such cause. Palpitation due to muscular failure is most marked after effort:

Predisposing causes.—Occupation, habits, and numerous other causes often predispose to palpitation. The individuals most frequently affected are young adults, and persons beyond middle age; females; nervous persons; and fat, flabby people, who live highly, and are habitually dyspeptic.

Irregularity is a form of cardiac disturbance often existing alone or accompanying palpitation, and it is often a serious indication of want of power. It may affect only the rhythm or force of the heart's action, or both. Rhythmical irregularity is due to a halting, hesitation, or partial arrest of the ventricular contraction, which may be brought about by a disturbance of the balance of power between the vagus and cardiac ganglia; or, more commonly, between the opposition offered to the blood to be driven and the power to drive it (Fothergill). It is often, but by no means necessarily, associated with grave organic disease, especially dilatation: or with low conditions of the system, such as malignant fevers. The irregularity may appear to be of a hesitating or anticipating character; sometimes it passes through regular cycles, but in other cases the cardiac action seems altogether confused.

Intermittency is the most advanced evidence of cardiac failure, and signifies that there is a complete arrest in the ventricular contractions, until two or sometimes more auricular contractions have occurred, which are required before sufficient blood is sent into the ventricle to rouse its walls into activity. The conditions with which it may be associated are fatty degeneration of the heart; aortic obstruction; hypertrophy and dilatation; irritation of the vagus nerve, either at its root from cerebral disease, or in its course from pressure by a

tumour; the advanced stages of severe fevers; diseases of the lungs causing great obstruction to the circulation, the left ventricle being disturbed under these circumstances along with the right; or mere nervous disorder of the heart. It may even be brought on voluntarily, by holding the breath.

SYMPTOMS.—Palpitation is generally accompanied with increased frequency and quickness of the heart's beats, as well as with augmented force, especially when a severe paroxysm comes on: The action may be quite regular; or attended with various forms of irregularity, or with intermittency. There is also frequently some inequality in the force of the cardiac pulsations. Various unpleasant subjective sensations are usually experienced over the cardiac region, the patient being conscious of the heart's action, and this may be associated with a sense of rolling, jogging, sudden falling back, jumping into the throat, and other indefinable feelings—*præcordial distress* or *anxiety*. There is occasionally considerable pain, which may be almost anginal, and this is relieved in some cases by pressure. Severe paroxysms are often attended with very serious symptoms, namely, faintness, occasionally ending in actual syncope, especially in cases of palpitation due to nervous exhaustion; dyspnoea, with hurried breathing, and an inability to "catch the breath;" flushing of the face, with a sense of heat, headache, giddiness, disturbed vision, and noises in the ears; and cold, clammy extremities. Sometimes there is much anxiety and fear of dissolution. The radial pulse usually corresponds to the heart's beats, but not always; it is in many cases small and weak, even when the heart is acting violently and the large arteries throb, being generally also quick and sharp.

A form of cardiac disturbance has been described under the term "irritable heart," first applied by Dr. Da Costa to cases observed by him in the American War, and due to hard field service, diarrhoea, fevers, and other depressing causes, especially acting upon persons of nervous temperament, under circumstances of intense excitement. Similar cases have been recognized in our own army, and also in civil life, being in the latter case particularly induced by over-work combined with worry and anxiety, though it may be induced by other causes. The complaint is characterized by a variable degree of palpitation, often brought on by exertion, or occurring when the patient is in bed, especially when lying on the left side, and frequently attended with much distress; a small and rapid pulse, easily compressible, and much influenced by posture; often pain about the cardiac region and left shoulder; embarrassed breathing; and nervous symptoms. It is often very intractable.

The *duration* and *severity* of a fit of palpitation vary greatly, the symptoms being usually more serious when there is irregularity of the heart. The paroxysm is often terminated by profuse diuresis of light-coloured urine; or a sense of much exhaustion follows, which calls for a prolonged sleep. The palpitation induced by drinking strong tea is sometimes of a very distressing character. Occasionally this symptom is constantly present in great intensity, apart from any organic cardiac disease, of which I have met with some well-marked examples in young women, generally, but not always, associated with Graves's disease.

Physical signs will of course depend upon whether the heart is organically affected or not. The signs which may be due to mere palpitation are as follows :—1. *Impulse* is too extensive ; often strong, but not heaving ; and it may be irregular in rhythm and force, jogging, fluttering, or intermittent. 2. *Dulness* is occasionally increased towards the right in prolonged cases, from over-distension of the right cavities with blood. 3. *Heart-sounds* are often louder than natural, with a marked tendency to reduplication. 4. Occasionally a *temporary systolic murmur* may be heard at the base of the heart, or at the left apex, the latter arising from irregular action of the muscoli papillares.

Intermittent action of the heart is sometimes attended with the most distressing and horrible sensations, there being an intense dread of impending dissolution.

DIAGNOSIS.—The important matter as regards diagnosis to be determined is to find out the cause of the disturbances of the heart's action included under the term palpitation, and particularly to ascertain whether they are due to organic disease or not. A satisfactory conclusion can only be arrived at by making a thorough physical examination, and by taking into consideration all the circumstances of the case. The impulse of palpitation differs from that of hypertrophy in not being heaving in quality.

PROGNOSIS.—This will depend greatly upon the cause of the disturbed action, and especially upon the presence and nature of any organic disease. It must not be thought, however, that simple palpitation is harmless, for it may prove very serious. Irregularity or even intermittency is by no means a certain sign of organic disease, as both these conditions may be associated with mere functional disorder.

TREATMENT.—1. *During a paroxysm* of palpitation the chief measures to be adopted are to get rid of every source of reflex irritation, or of any other obvious cause ; to enjoin perfect quiet, and calm the patient as much as possible ; to administer *antispasmodics*, *sedatives*, and *stimulants*, such as brandy, ether, animonia, opium or morphia, hydrocyanic acid, bromide of potassium, tincture of henbane, musk, camphor, tincture of lavender, galbanum, or assafoetida, as well as medicines which act upon the heart directly, especially digitalis ; and to apply dry heat or sinapisms over the præcordial region, with heat to the extremities, if required.

2. *During the intervals*, as well as in cases of a *chronic* nature, it is necessary to look to the state of the heart, digitalis being often most valuable for improving its action when there is muscular failure ; to avert every possible cause of fits of palpitation, by removing mechanical pressure, getting rid of reflex irritation, attending to the diet and digestive organs, and regulating the habits generally, especially avoiding excess in the use of alcohol, tobacco, or tea, as well as over-study and other forms of mental excitement, and venereal excess ; to treat any constitutional diathesis or local disease, such as gout or renal disease ; and, if requisite, to improve the condition of the system generally, but especially that of the nervous system and blood, by giving mineral tonics, mineral acids, quinine, strychnine or tincture of *nuxvomica*, or various preparations of iron ; aided by the employment of cold baths, douches with friction, a proper amount of exercise, and change of air

and scene. A mixture containing tincture of steel, nux vomica, and digitalis is often most beneficial. A belladonna plaster may be worn from time to time over the cardiac region.

The principles of treatment applicable to the other forms of cardiac disturbance are similar to those just indicated.

CHAPTER III.

DISEASES OF THE PERICARDIUM.

I. ACUTE PERICARDITIS.

ÆTIOLOGY.—Cases of pericarditis may be classed as *primary* and *secondary*, according to their mode of origin; the great majority belong to the latter class. The affection may arise under the following circumstances:—1. In connection with certain *blood-diseases*, especially rheumatic fever and Bright's disease, and occasionally pyæmia, typhoid, typhus, variola, scarlatina, puerperal fever, gout, scurvy, or purpura. It has been stated to result from the state of the blood in cyanosis; or after the cure of cutaneous diseases of long continuance. 2. From *injury*, such as a wound of the pericardium, or its laceration by fractured ribs—*traumatic pericarditis*. 3. From *perforation*, e.g., a neighbouring abscess opening into the pericardium—*perforative pericarditis*. 4. From *extension* of adjoining inflammation; or irritation set up by neighbouring disease, e.g., pleurisy, pneumonia, chronic cardiac disease, aneurism of the aorta, abscesses in the vicinity, carious ribs, tumours. In these cases the pericarditis tends to be localized. 5. From *irritation* by some new formation in the pericardium, as cancer or tubercle. 6. *Idiopathic* pericarditis has been described, resulting from "cold"; but it is extremely doubtful whether the affection ever arises from this cause alone.

ANATOMICAL CHARACTERS.—The morbid appearances in pericarditis are similar to those observed in other serous inflammations, and they run a similar course. The exudation is generally deposited on both surfaces, but is usually most abundant on the visceral portion of the pericardium; rarely is it observed over the whole extent of the sac, being generally in patches, and it may be confined to a small area, especially about the great vessels. The thickness and mode of deposit are very variable, the lymph being either stratified, or presenting little elevations, ridges, bands, masses, and numerous other arrangements. Usually the material is tolerably consistent, and sometimes quite tough, adhering fairly to the surface. In low conditions it may be soft and granular. The effusion is generally sero-fibrinous, with flocculi floating in it; in exceptional cases it may contain an admixture of blood or pus, and in extremely rare instances is actually purulent. The quantity is not usually above from eight to twelve ounces, but may range from an ounce or two to three pints or more. Gas is sometimes present,

arising from decomposition of the fluid. Sloughing of the membrane is said to occur occasionally.

The processes of absorption and adhesion are precisely identical with those described under pleurisy. The adhesions may be merely in the form of loose bands, or of more or less extensive agglutinations of the two surfaces, and the inflammatory irritation sometimes extends through the pericardium, so as to cause its union with the chest-walls. When seated about the great vessels, the lymph often leads to their adhesion to one another; or it may remain as a hard mass of considerable thickness.

Allusion may here be made to the so-called *white patches* sometimes observed on the pericardium. As a rule these are decidedly merely due to friction; but they may be the remnants of inflammation.

SYMPTOMS.—It is in the course of acute rheumatism or Bright's disease that pericarditis almost always comes under notice in ordinary practice, and it should be particularly looked for in these affections. Pericarditis may set in without any evident symptoms, but this is not usually the case, though it must be noted that the clinical phenomena observed will be modified considerably by the condition with which the disease is associated; as well as by its combination with other cardiac inflammations, or with distinct complications, such as pneumonia.

At the outset *local* symptoms are generally present, viz., pain, tenderness, and disturbed action of the heart. The pain is generally felt over a part or the whole of the præcordial region, occasionally in the epigastrium, while sometimes it shoots in different directions; its severity and characters vary widely, it being described as mere uneasiness, or dull aching, shooting, stabbing, burning, or tearing, and it may amount to the most intense suffering. Tenderness is experienced as a rule over the corresponding intercostal spaces, as well as in some instances when upward pressure is made over the epigastrium. The disturbed cardiac action is indicated by palpitation, sometimes violent.

An attack of pericarditis may be ushered in by slight rigors, followed by pyrexia. When it occurs in connection with acute rheumatism, however, such phenomena are commonly absent, there being no increase of fever previously existing. The pulse is necessarily hurried, and may be very frequent.

When fluid accumulates in the pericardium the pain generally subsides, but the action of the heart is interfered with, as well as the functions of neighbouring structures, in proportion to the quantity of the effusion, and the rapidity with which it collects. Hence serious symptoms are liable to arise, indicating either a tendency to syncope; overloading of the right heart and venous system; interference with the respiratory functions; or grave nervous disturbance. The pulse often becomes very frequent, feeble, small, and in bad cases irregular; sometimes it is slow and laboured. Dyspnoea is present, and may be extremely severe, even amounting to constant or paroxysmal orthopnoea, and accompanied with a sense of great oppression across the chest. A dry, irritable, spasmodic cough is not uncommonly observed. In grave cases the face assumes a very anxious and distressed expression, and becomes pale or more or less cyanotic; the expired air is cool; and the extremities feel cold. The mode of decumbency is generally on the

back, with the head high; some patients prefer lying on the left side, others on the right; while occasionally they are obliged to be propped up, or even to bend forwards. Frequently there is much restlessness, provided the patient is not prevented from moving on account of the pain which accompanies rheumatic fever. Headache and sleeplessness are common symptoms, and among occasional serious nervous phenomena may be mentioned delirium, occasionally almost maniacal; stupor; subsultus tendinum and jactitation; clonic or tonic spasms; choreiform or epileptiform symptoms; and dysphagia. In most cases, however, these probably depend rather on the general condition with which the pericarditis is associated. Vomiting is sometimes a prominent symptom. Should death take place, it usually results either from failure of the heart's action and consequent syncope, which may be sudden, from making the patient assume a sitting posture when the pericardium is very full of fluid; from interference with the aëration of the blood and with the circulation, the lungs becoming oedematous, and dropsy setting in; or from nervous disturbance.

PHYSICAL SIGNS.—In the **early stage** the only reliable signs of pericarditis are:—1. *Excited action* of the heart, as evidenced by the impulse. 2. *Pericardial friction-fremitus*, which is extremely rare. 3. *Pericardial friction-sound*. It must be mentioned, however, that friction-sound may be absent, either on account of the soft consistence of the lymph; or from its being deposited only on one surface, or at the back of the heart.

In the **effusion-stage** the *physical signs* are more or less marked in proportion to the quantity of the fluid, being of the following nature:—1. There is usually *bulging* of the cardiac region, especially in young persons. This may extend from the 2nd to the 6th or 7th cartilage, the spaces being widened or even protruded, and sometimes the left edge of the sternum is pushed forwards. Local measurements are increased. 2. The *impulse* presents several important changes. *a*. It is displaced, usually upwards and to the left, but sometimes downwards; while its position alters with change of posture. *b*. Its force is much diminished, and the impulse may be visible when not perceptible to the touch. Often it can be felt in the erect or sitting posture, when absent in the lying posture. There is sometimes great irregularity in its force. *c*. In rhythm the impulse tends to be delayed slightly after the systole; it may also be extremely irregular. *d*. The character is undulatory when there is much fluid, this being observed over a variable area, and being modified by position; the undulations usually appear to pass from below up and from left to right, but they may have a horizontal direction. 3. *Cardiac dulness* is materially altered in extent, degree, and shape. It increases first about the base of the heart, extending upwards and then laterally. Usually it does not pass below the 6th rib, but in extreme cases may reach considerably lower than this, the fluid pushing down the diaphragm and causing protrusion of the epigastrium. In an upward direction it may extend as high as, or even above the clavicle; and transversely from the right border of the sternum to beyond the left nipple. A very important character may be observed when the fluid is abundant, viz., that dulness extends to the left beyond the apex-beat. The shape of the dulness is more or less

triangular, with the apex upwards. Its intensity is unusually marked. Change of posture will modify it; the area is larger in the lying than the sitting position, but if the amount of fluid is not very great, it extends higher in the latter posture. 4. The *heart-sounds* are more or less feeble at the apex, and appear to be deep and distant; but on passing the stethoscope upwards towards the base, they become louder and more superficial. Change of posture may influence the sounds. 5. It is said that a *basic systolic murmur* is heard occasionally, due to pressure on the aorta. 6. *Friction-phenomena* often persist for a variable time while fluid is accumulating, becoming by degrees less marked, or being only observed in certain positions. 7. Pericardial effusion will necessarily affect *neighbouring structures*, especially the lungs. Vocal fremitus and resonance, as well as breath-sounds, are diminished in area over the cardiac region; ægophony is occasionally heard above and to the left, while vocal resonance is intensified on the borders of the dulness. Dulness at the base of the left lung may possibly be observed, indicative of partial collapse, the result of pressure by the distended pericardial sac on the bronchus or lung. The liver and spleen are in some cases depressed, along with the diaphragm.

Should **absorption** take place, the signs become gradually normal in favourable cases, and it is only requisite to notice that the *dulness* diminishes from above and laterally; and that the *friction-signs* return, usually in an increased degree, the sound also assuming more of the "churning" and "clicking" characters. The phenomena indicating chronic adhesion will be hereafter considered.

DIAGNOSIS.—In the early period the chief matter in diagnosis is to distinguish *pericarditis* from *endocarditis*. Symptoms are by no means reliable, but severe local pain would be in favour of pericarditis. The diagnosis, however, must be founded on the different characters of the morbid sounds present in each disease, being aided occasionally by the existence of friction-fremitus. When any difficulty is experienced, which is not uncommon at first, the case must be thoroughly watched in its further progress. Pericardial friction might be mistaken for pleuritic friction of cardiac rhythm; or it might be simulated by oedematous integuments, fluid in the mediastinum, or the friction of a cirrhotic liver.

Pericardial effusion is most liable to be mistaken for *cardiac enlargement*, but the circumstances under which it arises, coupled with the symptoms and physical signs which characterize this condition, ought rarely to leave any doubt as to the diagnosis. The dulness of pericardial effusion might be confounded with certain extrinsic conditions, which will be presently pointed out. The distinctions between *inflammatory effusion* and mere *hydropericardium* will be indicated after the latter affection has been considered.

TERMINATIONS.—Pericarditis may end in practical recovery, generally, however, more or less adhesions remaining behind; in death; or by becoming chronic, either the effusion remaining, and in rare instances becoming purulent, or even pointing and opening externally; or extensive agglutinations forming, which greatly disturb the cardiac action. As a consequence hypertrophy or dilatation of the heart may follow; or, in exceptional cases, atrophy or fatty degeneration of its structure, owing to pressure on the coronary arteries.

PROGNOSIS.—The immediate prognosis will depend upon the condition with which acute pericarditis is associated, it being, for instance, very dangerous in Bright's disease; the amount and nature of the effusion; the previous condition of the heart; the state of the pulse, as indicated especially by the sphygmograph; whether the disease is complicated with other inflammations; and the severity and character of the symptoms. Marked nervous symptoms are of very serious import. The ultimate prognosis must be entirely governed by the conditions remaining behind; extensive agglutination, and permanent displacement of the heart in consequence of adhesions, are untoward events.

TREATMENT.—The principles of treatment in pericarditis are similar to those mentioned as applicable to pleurisy, but as the former occurs almost always in the course of some other complaint, its management must be modified accordingly. When it occurs in connection with acute rheumatism, the treatment for this affection must be persevered in, and opium given freely, for the purpose of calming the excited action of the heart, care being taken, however, to avoid narcotizing the patient, especially should there be any tendency to cyanosis. Venesection and mercurialization are never admissible. A few leeches may be sometimes applied over the cardiac region with advantage in robust subjects, but as a rule the persistent application of heat and moisture over this region, by means of linseed-meal poultices or fomentations, is the most serviceable local treatment. Great care must be taken that the applications are frequently changed; and that the chest is not unduly exposed or chilled. Cold is strongly recommended by some writers, as strongly condemned by others; it certainly should only be tried very cautiously, in my opinion. Aconite, veratria, and tartar emetic have also been given, with the view of calming the heart's action, but these are dangerous remedies in pericarditis.

For the *removal of effusion*, if this is not readily absorbed, the application of blisters or strong iodine may be tried, if necessary; with *diuretics* and iodide of potassium internally. Tincture of iron in full doses is decidedly a valuable drug at this time; and *tonics* are often useful.

As a rule a good quantity of nourishment is required, and in many cases a little stimulant is indicated; if there is much depression, with failing cardiac action and pulse, a considerable amount of brandy may be necessary, and digitalis is indicated under these circumstances. The patient must be kept at rest, and should not be examined unnecessarily, or be made to sit up, if there is any danger of syncope.

Paracentesis is called for in rare instances, in order to relieve dangerous symptoms, or to remove purulent fluid. Some advocate early recourse to this operation, but, for obvious reasons, it ought not to be rashly practised. The fluid is best removed by means of the aspirateur.

In pericarditis complicating Bright's disease or low fevers, free stimulation is usually required; while opium is contra-indicated, or must be employed with exceeding caution.

The symptoms which are liable to arise in the course of pericarditis must be treated by the usual remedies.

II. CHRONIC PERICARDITIS—ADHERENT PERICARDIUM.

ANATOMICAL CHARACTERS.—Chronic effusion may remain after acute pericarditis; or sometimes the surfaces of the membrane become universally agglutinated, and calcareous matter may be deposited in the adhesions; or the outer surface of the pericardium may further unite with the chest-wall.

SYMPTOMS.—Subjective symptoms are often absent in cases of chronic pericarditis, but there may be uneasy sensations, or even a dull pain over the cardiac region, and, in exceptional cases, anginal attacks have been noticed. Disturbed action of the heart; palpitation easily induced; and shortness of breath on exertion are the chief symptoms complained of, if any. From the effects of extensive adhesions upon the heart, grave interference with its action and with the circulation may ultimately arise, and serious organic changes may be set up. An agglutinated pericardium will seriously increase the danger from an attack of any pulmonary inflammation.

Physical examination may reveal the presence of fluid in the pericardium; or, when adhesions have been formed between its surfaces, as well as with the chest-wall, the signs are more or less of the following character:—1. *Depression* of the præcordial region, with narrowing of the spaces. 2. Increase in extent, or permanent displacement of the *impulse*, especially elevation, there being no other obvious cause for this; the apex-beat being unaltered by change of posture, or by a deep inspiration; or the impulse having altogether unusual characters, being attended with recession of the spaces or of the epigastrium, or with an irregular jogging movement, both systolic and diastolic. 3. Usually increased area of *dulness*, which is not altered after a deep inspiration, there being other signs that the lungs do not expand over the cardiac region. When there is extensive calcification, the percussion-sound is said occasionally to have an osteal character. 4. A rough *friction-sound* may be heard over some part of the cardiac region.

III. HYDROPERICARDIUM—PERICARDIAL DROPSY.

The important facts relating to dropsy of the pericardium may be thus summed up, and it will at once be seen in what respects it differs from inflammatory effusion:—1. In the great majority of cases this condition is a part of chronic general dropsy; it may set in acutely in Bright's disease; and rare instances have been met with in which it owned a mechanical origin, having resulted from the pressure of an aneurism or other mediastinal tumour, disease or thrombosis of the cardiac veins, or sudden extreme pneumothorax. 2. There are no severe initiatory symptoms; pyrexia is absent; and there is no marked disturbance of the heart's action. 3. The effusion, which is simply serous, is not abundant. Hence there is no bulging; the physical signs indicative of fluid are less marked than in pericarditis; and the dulness is more liable to be altered by posture. 4. Friction-signs are absent throughout. 5. Hydropericardium generally follows hydrothorax, and

hence it is preceded by the symptoms and physical signs of the latter condition, the effects of which it necessarily tends to aggravate.

TREATMENT.—This is merely a part of the ordinary treatment for dropsy. Paracentesis might possibly be required.

IV. PERICARDIAL HÆMORRHAGE.

Blood may be found in the pericardium as the result of:—1. *Spontaneous rupture*, either of the heart or a cardiac aneurism; of an aortic aneurism; of one of the coronary vessels; or of vessels in cancerous deposits. 2. *Injury*. 3. *Pericarditis*, the effusion being more or less hæmorrhagic. 4. *Diseased conditions of the blood*, such as scurvy and purpura.

SYMPTOMS.—The symptoms are generally severe in connection with actual hæmorrhage into the pericardium, indicating loss of blood, and interference with the heart's action; but they will necessarily vary with the amount of blood present, and the rapidity of its accumulation. Sudden death may occur. The *physical signs* are those of an accumulation of fluid in the pericardial sac.

V. PNEUMO-PERICARDIUM.

Gas is occasionally found in the pericardium, either having entered from without, or resulting from decomposition of fluid in its cavity. It might give rise to *tympanitic resonance* over the cardiac region; and to *succussion-splash*, if mixed with fluid.

CHAPTER IV.

ACUTE INFLAMMATIONS OF THE HEART.

I. ACUTE ENDOCARDITIS AND VALVULITIS.

ÆTIOLOGY.—Almost invariably acute endocarditis is associated with some disease in which the blood is contaminated with a morbid poison, especially acute rheumatism, occasionally Bright's disease, pyæmia, septicæmia, scarlatina, small-pox, typhoid fever, puerperal fever, or other pyrexial diseases. Probably the inflammation results from direct irritation of the endocardium by the poisoned blood.

ANATOMICAL CHARACTERS.—It rarely happens that the endocardium is seen in the early period of inflammation, when this membrane merely presents bright redness, usually with distinct points of increased vascularization. Soon it becomes less smooth than normal, swollen, and clouded; diminishes in consistence; and loses its polish. Numerous young cells form in the sub-epithelial tissue, causing it to

become thickened; while little vascular villi or granulations also project on the surface. In some cases the endocardium assumes the appearance of a soft, velvety membrane. Fibrinous vegetations are soon formed, which are derived directly from the blood, its fibrin being deposited on the inflamed membrane, either in strata or in masses of considerable size. There is also exudation into the substance of the valves, the free edges of which are much thickened, especially those parts which are exposed to considerable friction and irritation, and the fibrinous vegetations are chiefly deposited on the surface which is opposed to the current of the circulation. Only the left cavities of the heart are usually involved in endocarditis, the orifices and the membrane in their vicinity, with the valves and their appendages, being especially affected. During intra-uterine life the disease chiefly attacks the right side.

As occasional consequences of acute endocarditis there may be observed fissuring of the membrane; actual ulceration, resulting from softening and destruction of tissue, the ulcers being irregular, superficial, and having thickened edges; formation of pus in the deeper layers, which ultimately reaches the surface; perforation, rupture, or extensive destruction of a valve; rupture of one or more chordæ tendineæ, the free ends of which may float in the blood, and lead to the deposit of vegetations; or the rapid formation of an aneurism of the heart.

Emboli are very liable to be detached from the fibrinous deposits, and evidences of these may be discovered in distant organs; or some of the products of inflammation may be conveyed into the circulation, and give rise to septicæmic signs in various parts.

If the inflammatory process subsides, the young tissue develops into an imperfect fibrous structure, and proliferation with subsequent organization may go on for some time, thus leading to most serious permanent organic changes, fatty and calcareous degeneration often finally occurring, which increase the damage. This is one of the conditions known as *chronic endocarditis*, but the affection may be chronic from the outset, there being a slow growth of new tissue, which tends to develop into a fibroid material. The ultimate changes are similar in both cases, and the chief morbid conditions resulting therefrom are as follows:—1. Thickening, induration, and puckering of some part of the general tract of the endocardium. 2. Thickening of the valves, with opacity, rigidity, and more or less shrinking, by which they may be greatly narrowed and rendered incompetent. 3. Adhesion of the tongues of a valve to each other, or to the walls of the heart. 4. Thickening, induration, and contraction of the chordæ tendineæ or muscoli papillares. 5. Narrowing of the orifices, usually accompanied with irregularity, roughness, and hardening. 6. Formation of firm warty growths, either sessile or pedunculated.

When atheroma and calcification take place, the structures present the usual characters indicative of these forms of degeneration.

SYMPTOMS.—Many cases of endocarditis are only revealed by *physical examination*. *Local* symptoms are always very indefinite, there being little or no pain or tenderness, but palpitation is frequently observed. The characters of the pulse have been variously stated by different

Observers; at first it is usually frequent, full, and excited; afterwards it may become feeble, small, and irregular in force and rhythm, but numerous circumstances influence it. Increased pyrexia may accompany endocarditis, the fever often tending to assume an adynamic type. The chief symptoms which may arise in the course of the disease, however, are those dependent upon:—1. Interference with the circulation at one or more of the orifices. 2. Formation of extensive clots in the heart, embarrassing its action, and causing obstruction to the flow of blood, indicated by extremely frequent and irregular cardiac action and pulse; tendency to syncope; great dyspnoea, amounting to orthopnoea in paroxysms, attended with extreme anxiety, and followed by asphyxial symptoms; and severe disturbance of the nervous system. 3. The convection of emboli to the spleen, kidneys, brain, and other organs; or of deleterious inflammatory products, the latter giving rise to symptoms of septicæmia.

PHYSICAL SIGNS.—The only positive signs which may be associated with endocarditis are those indicating excited action of the heart; some derangement at an orifice; or extensive coagulation of blood. 1. The *impulse* is often forcible and increased in area; if coagulation takes place, it tends to become irregular in rhythm and force. 2. *Increased dulness*, especially towards the right, may arise from stagnation and clotting of blood in the cavities of the heart. 3. The *sounds* are often altered in character, but this is not to be relied upon. 4. The great sign of endocarditis is the presence of one or more *endocardial murmurs*, but it must be remembered that these may have previously existed. Different observers have given different statements as to the valvular lesion most frequently present. In my own experience *mitral regurgitation* has been decidedly the most common condition in acute endocarditis, but this may in some cases result from irregular action of the muscoli papillares. *Aortic obstruction* is not uncommon. *Pulmonary obstruction* murmur may be observed as the result of coagulation in the right cavities; but on the left side clotting of blood sometimes interferes with the production of a murmur.

DIAGNOSIS.—Not only must endocarditis be distinguished from pericarditis, but it must be remembered that the symptoms arising in its course render it liable to be mistaken for certain low fevers; and that physical examination should be made at frequent intervals in those diseases in which it is apt to supervene, so that the morbid condition may be detected in its earliest development.

PROGNOSIS.—There are always immediate dangers in connection with acute endocarditis, which have been indicated above. The remote prognosis will depend on the permanent organic changes which the disease originates; and on the orifice which is affected.

TREATMENT.—The treatment of endocarditis is mainly that of the disease in the course of which it occurs, and no direct remedies are known for this complaint. Such measures as bleeding, mercurialization, and the local application of cold are decidedly to be deprecated. As a rule *stimulants* are required, in some cases in large quantities, along with abundant nutriment. Digitalis is indicated, should the heart's action be failing. Should there be signs of obstruction from coagulation of blood in the cavities of the heart, alkalies and carbonate

of ammonia must be given freely, along with alcoholic and other stimulants. Septicæmic symptoms may also call for special treatment. It is exceedingly important, after an attack of acute endocarditis in which the valves are involved, to keep the patient in bed for some days, and afterwards at rest and under observation for a considerable time, so as to maintain the heart in a state of quiescence, and not to throw any strain on the diseased structures, thus enabling them to recover as much as possible, and limiting the growth and development of connective-tissue corpuscles. I quite agree with Dr. Fothergill * that it is a serious error on the part of many practitioners to aim at making their patients sit up as soon as possible after an attack of acute rheumatism with endocarditis, or to discharge them as cured, in order to exhibit the advantages of some particular line of treatment for this disease.

II.—ACUTE MYO-CARDITIS.

ÆTIOLOGY.—Inflammation of the heart-substance is frequently set up in the layers contiguous to an inflamed endocardium or pericardium. Myo-carditis has been stated to have arisen independently in a few instances, either as a diffuse or localized inflammation, the latter having terminated in abscess. Pyæmia and septicæmia frequently lead to myo-carditis, with formation of abscesses.

ANATOMICAL CHARACTERS.—Myo-carditis is attended with discoloration and softening of the heart-substance, this being infiltrated with a sero-sanguineous fluid, fibrinous exudation, or sometimes pus, which may collect in abscesses. The disease occasionally leads to the formation of a cardiac aneurism; or to rupture of the walls of the heart. If recovery ensues, depressed scars may be left.

SYMPTOMS.—The clinical signs of myo-carditis are very obscure. It tends to render the cardiac action extremely weak and irregular, and when this is a prominent feature in the course of peri- or endocarditis, implication of the heart may be suspected. The general symptoms are pyrexia of an adynamic type; with signs of blood-poisoning and collapse.

TREATMENT.—The only hope lies in free stimulation.

CHAPTER V.

CHRONIC DISEASES OF THE HEART.

In the present chapter it is proposed to give an account of the several chronic morbid conditions to which the heart is liable. Their diagnosis, prognosis, and treatment will be considered in a separate chapter.

I. AFFECTIONS OF THE VALVES AND ORIFICES.

GENERAL ÆTIOLOGY AND PATHOLOGY.—The various conditions which may give rise to *cardiac murmurs* have been previously pointed out, and the characters of the different murmurs described (Vol. ii.,

* "The Heart and its Diseases," Second Edition.

pages 14—17). At present attention will be directed only to those cases in which there is some definite *organic* mischief affecting the valves or their appendages, or the orifices of the heart, which interferes with the circulation, either by causing *obstruction*, or by permitting *regurgitation*. In the first place it will be well to give a general summary of the pathological modes of origin of these derangements. They may arise from:—1. *Acute endocarditis*, especially, but not solely, in connection with acute rheumatism. 2. *Chronic endocarditis* or *valvulitis*, which in many cases appears to be merely a process of fibroid degeneration, the structures implicated being very liable to undergo further degenerative changes, in the direction of atheroma and calcification. This is observed as a rule in persons advanced in years, especially in gouty subjects, or in those suffering from chronic renal disease; it may, however, occur in younger individuals who are subject to violent physical strain, in consequence of which great pressure of blood is thrown upon the aortic valves, *e.g.*, strikers, colliers, gymnasts, or boat-racers. 3. *Laceration* of a valve from injury. 4. *Chronic myocarditis*, involving the muscoli papillares, which consequently become contracted and indurated, thus preventing the valves from closing. 5. *Atrophy of the valves*, or, as some suppose, *congenital insufficiency*, rendering them inefficient, or giving rise to so-called “reticulation” or more or less extensive perforation. 6. *Enlargement of the cavities* of the heart, involving the orifices without proportionate increase in the valves, which are therefore rendered incompetent; or altering the normal relations of the valves and their appendages to the orifices. 7. *Congenital malformations*, which are believed to result mainly from endocarditis occurring during intra-uterine life. 8. *Fibrinous deposits* from the blood. 9. *Tumours* very rarely.

It must be mentioned that more than one orifice may be affected from the same cause; and that disease at one orifice may set up mischief in another, either by direct extension, by throwing an extra strain upon the valves and thus inducing chronic valvulitis, or by enlarging the corresponding cavity of the heart.

SPECIAL VALVULAR DISEASES.—Having giving this general outline, the main facts connected with each orifice will now be specially considered in detail, under the following headings:—1. **Ætiology.** 2. **Anatomical characters.** 3. **Clinical phenomena**, including the signs immediately connected with the lesion; its direct effects upon the circulation, and the symptoms resulting therefrom; and its remote effects upon the heart. It may be remarked once for all at the outset, that *local symptoms* are very uncertain and unreliable. Uneasiness or pain over the cardiac region may be complained of, but is absent in the majority of cases; it is most frequent in connection with aortic disease. Palpitation and dyspnoea are common symptoms, and frequently render the patient incapable of much exertion.

A. MITRAL REGURGITATION.

Ætiology.—1. Acute endocarditis is the ordinary cause of this condition, the subsequent chronic changes increasing the primary mischief. 2. Cases occasionally are met with in which no history can be

obtained of acute endocarditis, and the affection seems to have been chronic and gradual in its progress from the first, being either due to chronic inflammatory changes or to degeneration. 3. Mitral regurgitation is liable to supervene upon aortic disease, being produced in one or other of the ways already indicated. 4. Very rarely it may result from mere dilatation of the left cavities, causing enlargement of the orifice, and displacing the muscoli papillares.

ANATOMICAL CHARACTERS.—The chief morbid conditions observed in different cases of mitral regurgitation are more or less contraction and narrowing of the tongues of the valve, with irregularity, thickening, and rigidity, there being in some instances scarcely any appearance of a valve; atheroma or calcification; laceration of one of the valve-tongues; adhesion of one or more of them to the inner surface of the ventricle; rupture of chordæ tendineæ; shortening, thickening, induration, or adhesion of these structures, the smaller ones having often entirely disappeared; contraction and hardening of the muscoli papillares; and deposits of fibrin, sometimes in considerable abundance.

CLINICAL PHENOMENA.—**Immediate signs.** These are:—1. A *systolic thrill* at the left apex, present only in a small proportion of cases. 2. *Mitral systolic murmur*. 3. *Intensification* of the *pulmonary second sound*, which is not uncommonly louder than the aortic.

Effects upon the circulation.—The arterial system will be insufficiently and irregularly supplied with blood; hence the pulse is small, weak, and often unequal in force and fulness, not infrequently also irregular in rhythm. These characters are shown in the sphygmographic tracing. Two striking phenomena are sometimes observed in connection with mitral regurgitation, viz., that the patient presents an extremely anæmic appearance; and that, although the heart may be acting violently, and the great arteries in the neck may even appear to throb, scarcely any pulsation is felt in them. Through the “back-working” of mitral regurgitation, the pulmonary circulation becomes necessarily overloaded more or less speedily, the symptoms and ultimate consequences of which have been already described. Emboli may also be carried from clots in the right heart, and give rise to pulmonary infarctions. In time the right side of the heart and general venous system become involved, venous hyperæmia and its consequences being induced, often to an extreme degree.

Effects upon the heart.—The left auricle first becomes the seat of dilatation with hypertrophy, and afterwards the right ventricle, which is often greatly enlarged, and as a consequence tricuspid regurgitation follows. A moderate degree of hypertrophy with dilatation of the left ventricle is generally observed, and it may become very considerable. Degeneration of the heart-structure is liable to be set up in time; and the endocardial lining of the left auricle tends to become thickened, opaque, and atheromatous.

B. MITRAL OBSTRUCTION.

ÆTIOLOGY.—Mitral obstructive disease is almost always the result of acute endocarditis and its consequences. Occasionally it cannot be traced to this cause, and then has been supposed to be congenital.

ANATOMICAL CHARACTERS.—Usually the mitral orifice is more or less in a state of constriction or *stenosis*; its margins being also rough, irregular, and thickened. One or other of these conditions predominate. Occasionally the tongues adhere together by their edges, and a funnel-shaped opening may be thus formed, or a so-called “button-hole” mitral valve. Abundant vegetations on the valves or about the orifice may cause mitral obstruction in exceptional instances.

CLINICAL PHENOMENA.—These do not require any lengthy description, and it will suffice to state that the phenomena of mitral obstruction differ from those accompanying mitral regurgitation in the following particulars :—1. *Thrill* is much more frequently felt, and is præsyntolic. 2. The *murmur* is præsyntolic or post-diastolic, and presents different characters from that of mitral regurgitation. 3. The *pulse* is usually regular, at least such has been my experience in a considerable number of cases, though some observers regard irregularity of the pulse as an important sign of mitral obstruction. 4. The *left ventricle* is small, and disposed to become atrophied. The effects on the circulation are similar in both cases, but they are less marked and more slowly produced in mitral obstruction.

In not a few instances *mitral regurgitation* and *constriction* exist together. The interference with the circulation, and the changes in the cavities of the heart, are necessarily more readily induced under these circumstances. A double thrill may be felt. Frequently there are two distinct murmurs, but there may be but one. Mitral disease is common in young persons.

C. AORTIC OBSTRUCTION.

ÆTIOLOGY.—1. As a rule chronic valvulitis, ending in atheroma and calcification, originates aortic obstruction, the morbid process gradually advancing: hence this affection is very frequent in old people. It is this valve also which is involved in those individuals who undergo severe muscular strain. 2. Cases are not uncommonly observed, however, in which aortic obstruction can be distinctly traced to acute endocarditis.

ANATOMICAL CHARACTERS.—In most cases the obstruction depends upon the valves, which project inwards, and become rigid, thickened, irregular, opaque, contracted, atheromatous or calcareous, so that they cannot be pressed back by the blood, but remain constantly in the current of the circulation. Often they are covered with considerable fibrinous masses, and the opening of the artery may thus be almost completely closed. Occasionally constriction at or about the aortic orifice is the pathological condition giving rise to obstruction.

CLINICAL PHENOMENA.—**Immediate signs.** These are :—1. *Systolic thrill* at the right base occasionally. 2. *Aortic systolic murmur*. 3. *Feebleness* or *absence* of the *aortic second sound*, if there is no regurgitation, that over the pulmonary artery being unaffected.

Effects upon the circulation.—The arteries being imperfectly filled, there is often pallor, with a tendency to symptoms of cerebral anæmia. The pulse is small, regular, and compressible, but is generally modified by hypertrophy or degeneration, and under the influence of

the latter it may become intermittent. A sphygmographic tracing shows a difficult and very oblique ascent; a rounded summit; and the secondary waves absent or slight. There is no evidence of obstruction to the pulmonary circulation, unless the mitral orifice becomes involved, so as to permit regurgitation. It is important to notice that particles of fibrin are very liable to be detached from the valves, and carried into circulation, thus giving rise to signs of embolism, especially in connection with the brain.

Effects upon the heart.—The tendency of aortic obstruction is to produce pure hypertrophy of the left ventricle, which compensates for the obstruction, so long as there is no degeneration. In course of time mitral regurgitation is apt to follow, being set up either by extension of disease from the aortic orifice; or by the forcible pressure of the blood upon the mitral valves.

D. AORTIC REGURGITATION.

ÆTIOLOGY.—1. This disease is also usually the result of chronic changes, and is especially frequent in those who undergo violent strain. 2. In some cases it follows acute endocarditis. 3. There may be a sudden rupture or laceration of the valve, the result of extreme pressure thrown upon it. 4. Regurgitation may take place through perforations in the valve, due to atrophy or congenital insufficiency. 5. In rare instances the orifice is dilated, and the valves are therefore incompetent to close it properly. 6. Degeneration at the root of the aorta may lead to the imperfect adaptation of the valves, and thus give rise to regurgitation.

ANATOMICAL CHARACTERS.—The ordinary state of the valves is that described under aortic obstruction, and they are often so shrunk, deformed, and rigid, that they permit regurgitation, as well as cause obstruction. Sometimes they adhere to the walls of the vessel; or a tongue is seen lacerated or ruptured, or having a considerable perforation in it; or there may be scarcely any remnant of the valve.

CLINICAL PHENOMENA.—It will be sufficient to point out the important characters which distinguish regurgitation from obstruction. 1. Very rarely is there any *thrill*, but possibly a diastolic thrill may be felt. 2. A well-marked *diastolic murmur* is generally present. 3. The *arterial pulse* is quite characteristic, owing to the blood being forced into the vessels under unusual pressure by the enlarged left ventricle, thus causing their excessive distension; while they afterwards rapidly subside, on account of the regurgitation. This can be observed in all the arteries, and has even been seen in the vessels of the eye by the aid of the ophthalmoscope. They become visible, tortuous, and elongated with each systole of the heart, presenting a worm-like movement; the pulse having a jerky, abrupt, and hard feel, succeeded by a rapid subsidence or “fall-back.” The sensation has been well described as resembling “balls of blood shot under the finger.” There is no irregularity so long as the heart-tissue continues healthy. The important characters of the sphygmographic tracing are that the line of descent falls suddenly; and that the aortic wave is more or less indistinct or

absolutely wanting. By observing the latter character, the degree of regurgitation may be determined. The line of ascent is usually long and vertical, with a sharp summit, but this may be square or convex if obstruction also exists. The distension-wave is raised, and the notch preceding it is exaggerated, while unusual vibratory-waves are not uncommon. A loud murmur is often heard in the main arteries. In course of time they are very prone to become dilated and the seat of degenerative changes, owing to the repeated strain exercised upon them. 4. The principal morbid change developed in connection with the heart consists in hypertrophy with dilatation of the left ventricle, which tends to become extreme. The hypertrophy is at first usually in excess of what is required for compensation, which accounts for the great distension of the arteries, while it also gives rise to symptoms indicative of arterial and capillary plethora. Degeneration of the enlarged heart is, however, liable to set in speedily, and this has been explained by some authorities in the following way:—It has been supposed that the supply of blood to the walls of the heart, through the coronary arteries, depends upon the aortic recoil, and not upon the ventricular contraction, therefore flowing in during the cardiac diastole; if there is incompetency of the valves, allowing the blood to return to the heart, this force is rendered more or less inefficient, and consequently the walls are imperfectly nourished; the aorta and its large branches at the same time become atheromatous, and therefore deficient in elasticity. Recent observers, however, entirely contradict this account of the mechanism of the blood-supply to the heart, and affirm that it takes place during the cardiac systole. The mitral orifice is in danger of becoming involved in cases of aortic regurgitation, as well as in those of obstruction. Serious symptoms are liable to follow both the events just indicated.

E. TRICUSPID REGURGITATION.

ÆTIOLOGY.—Practically this condition is either associated with dilatation of the right cavities, consequent upon some obstruction to the circulation in the lungs, especially associated with emphysema; or it follows mitral disease, being then partly due to disease of the valves, owing to the continued extra-pressure of the blood upon them.

ANATOMICAL CHARACTERS.—The tricuspid orifice may be simply dilated, the valves being thus rendered incompetent, but being free from disease; or the valves, especially the fixed tongue, with the chordæ tendineæ, are occasionally contracted and deformed. I have now and then observed abundant fibrinous deposit upon the ventricular surface of the tricuspid valves, when there was scarcely any organic mischief affecting their structure.

CLINICAL PHENOMENA.—**Immediate signs.** 1. It is stated that a *systolic thrill* has been felt in the epigastrium, but this must be extremely exceptional. 2. The characteristic *systolic murmur* is more frequently absent than present, and requires usually an experienced auscultator to detect it. In exceptional instances, however, it is well-marked.

Effects upon the circulation.—The general venous system suffers *speedily and seriously* in connection with tricuspid regurgitation, and

all the symptoms resulting from overloading of the veins are liable to follow, this condition being a prominent cause of cardiac dropsy. The abdominal circulation is affected very early, on account of the deficiency of valves in the veins here. In addition, some important *physical signs* are originated, viz. :—*a.* Distension and varicosity of the cervical veins, especially of the right external jugular; and sometimes of the veins over the chest. *b.* Venous pulsation in the neck, and, according to some observers, in the inferior vena cava and hepatic vein. *c.* Filling of the external jugular vein from below, after it has been emptied by pressure. The pulmonary circulation is relieved, and thus pulmonary symptoms are often diminished when tricuspid regurgitation supervenes.

Effects upon the heart.—Tricuspid regurgitation tends to increase hypertrophy of the right ventricle; and to cause enlargement of the corresponding auricle. If considerable, it may diminish the intensity of murmurs on the left side of the heart.

F. TRICUSPID OBSTRUCTION.

This condition is a mere curiosity, if it ever exists. It might possibly be the consequence of endocarditis occurring during intra-uterine life; and its signs and effects would be similar to those of regurgitation, except that the murmur would be præ systolic.

G. PULMONARY OBSTRUCTION AND REGURGITATION.

A very few observations will suffice for the affections of the pulmonary orifice. They are extremely rare, especially *regurgitation*. In the great majority of cases *pulmonary obstruction* is due to congenital constriction of the orifice, which may be extreme; sometimes the valves are much thickened, atheromatous, or calcareous. This disease originates a *systolic thrill* and *murmur* at the left base. The pulse is not affected, this constituting an important distinction from aortic disease. Signs of right hypertrophy and dilatation often appear in course of time; followed by overloading of the systemic veins. *Pulmonary regurgitation* would give rise to a diastolic murmur at the left base. I have met with one instance in which marked constriction and regurgitation existed together, accompanied with a loud double murmur.

II. ENLARGEMENT OF THE HEART.

Enlargement of the heart may be due to :—1. Hypertrophy of its muscular walls. 2. Dilatation of its cavities. In most instances there is a combination of these conditions, though in very variable degrees, but the varieties met with are sufficiently indicated in the following classification :—1. *Simple hypertrophy*. 2. *Eccentric hypertrophy*, or hypertrophy with dilatation, the former being in excess. 3. *Dilatation with hypertrophy*, the dilatation being the more marked. 4. Dilatation

with attenuation of the walls, or *simple dilatation*. A form has been described as *concentric hypertrophy*, in which the cavities are contracted, but in reality this appearance is merely due to post-mortem contraction of the walls of a hypertrophied heart.

It will be convenient to consider hypertrophy and dilatation together, any special facts relating to either of these morbid conditions being indicated as occasion arises.

ÆTIOLOGY.—The numerous causes of cardiac enlargement may be ranged under certain heads.

1. *Direct obstruction, either in connection with the orifices of the heart or with the vessels, which interferes with the passage of the blood.* Cardiac obstruction is usually seated at the aortic or mitral orifice, very rarely at the pulmonary opening. The *aorta* may be obstructed from extensive atheroma or calcification; aneurism; congenital constriction or coarctation; or external pressure upon the vessel by an aneurism or other tumour. In connection with the *general circulation* the chief conditions giving rise to cardiac enlargement are extensive atheroma and calcification of the arteries; changes in the arterioles and capillaries accompanying chronic renal disease; and alterations in the calibre of the small vessels associated with exophthalmic goitre. In the *pulmonary circulation* obstruction may arise from congenital constriction of, or external pressure upon, the pulmonary artery; chronic pulmonary diseases, especially chronic bronchitis with emphysema, extensive pleuritic adhesions with retracted side, and interstitial pneumonia; or atheroma of the pulmonary vessels.

Obstruction tends more especially to lead to hypertrophy, but if it is brought about suddenly, a primary dilatation ensues; when, however, the obstruction is gradual in its progress, the hypertrophy is often of the most pure type.

2. *Distension of the walls of the heart during diastole, under increased pressure.* This is a most important cause of cardiac enlargement, being chiefly exemplified by aortic and mitral regurgitation, and to a less degree by tricuspid regurgitation. In these conditions there are two currents of blood entering the cavity into which regurgitation takes place, often under excessive pressure. At first dilatation is produced, but in most cases hypertrophy is soon superadded, the relative proportions depending upon various circumstances. The heart may ultimately assume enormous dimensions.

3. *Constrained action of the heart, in consequence of which the contraction of this organ is impeded, and it has to work under physical disadvantages.* Displacement of the heart from any cause, but especially from pleuritic effusion; interference with its action in consequence of a deformed thorax; and pericardial agglutination, are the important causes of enlargement coming under this head, and they tend chiefly to develop hypertrophy.

4. It is probable that mere *excessive cardiac action*, such as is observed in habitual nervous palpitation, may induce hypertrophy. Some authorities would explain this by affirming that there is an obstacle in the arterial circulation, owing to contraction of the muscular coat of the vessels, and that this leads to compensatory hypertrophy.

5. It has been stated that permanent enlargement may follow the

dilatation which frequently results from some *temporary loss of resisting power in the walls of the heart*, such as is associated with cardiac softening in low fevers; myo-carditis accompanying peri- or endocarditis; or mere nervous debility and want of tone, due to excessive smoking or venery and various other causes. After recovery a compensatory hypertrophy is said to be set up, and Fothergill is inclined to believe that this may lead to a reduction of the ventricular cavity to its original and normal dimensions.

6. I have deemed it best to notice separately that important class of cases, in which cardiac enlargement is the result of *repeated violent effort, especially with the arms*, such as is carried on in connection with certain laborious occupations (hammermen, colliers, &c.), gymnastic exercises, rowing, or climbing mountains. The enlargement is principally due to the obstruction to the circulation which is caused by the muscles crossing the arteries, the former also, owing to their rigid condition, opposing the passage of blood through their own vessels; and, after a time, to the aortic disease which is originated. The excessive action of the heart which is excited from time to time must not, however, be overlooked as probably aiding in bringing about the morbid condition. Enlargement of the right cavities is very liable to be developed in runners, swimmers, divers, and others who tax their wind unduly from time to time.

7. A *plethoric state of the system*, resulting from over-eating, especially of nitrogenized food, and abuse of alcohol, has been stated to cause hypertrophy of the heart, but this is probably associated with lithiasis.

8. Cases of hypertrophied heart now and then come under observation in which no cause can be traced, and then the hypertrophy is presumed to be *idiopathic* and *primary*.

With regard to *dilatation*, it is necessary to mention further, that this condition is more liable to supervene, and is more marked in those conditions which give rise to great internal pressure on the cardiac walls during diastole; when obstruction arises rapidly; and when the walls of the heart are deficient in resisting power from any cause, as after acute or long-continued chronic illness, or when they are the seat of congestion, serous infiltration, inflammation, or various degenerative changes, especially fatty and fibroid.

Before proceeding to the consideration of the morbid appearances and clinical phenomena associated with cardiac enlargements, it is needful to remark that these are influenced by certain important circumstances, prominent among which may be mentioned:—1. The nature of the enlargement, whether this is due to hypertrophy, dilatation, or to both conditions; and the relative degrees in which they are combined. 2. The part of the heart affected. 3. The state of the cardiac walls. 4. The condition of the valves and orifices. 5. The presence of pericardial adhesions.

ANATOMICAL CHARACTERS.—The important alterations produced in the heart by hypertrophy and dilatation may be stated as follows:—

1. *Increase in bulk*, this being mainly in proportion to the dilatation. 2. *Increase in weight*, which is due to, and therefore in the ratio of the hypertrophy. The enlargement and excess in weight vary greatly in degree, the heart being sometimes three or four times heavier than

usual, and enormously increased in dimensions. It is then called the *cor bovinum vel taurinum*. 3. *Change in shape*. In general dilated hypertrophy the heart tends to become more or less globular, the apex being rounded or obliterated. If the left cavities are alone involved, and especially merely hypertrophied, the heart is elongated and more conical, the apex of the left ventricle extending downwards some distance beyond the right. When the right side is solely affected, there is a tendency to roundness and increase in breadth, the right ventricle lying forwards, so as to overlap the left, and to form the apex. 4. *Alteration in position and axis*. As a rule the heart is lowered, and its apex is displaced to the left, while the right border becomes more horizontal, the last character being especially observed in enlargement of the right side, which may also extend the heart's limits in an upward direction. 5. *Changes in the thickness of the walls, and in the size and shape of the cavities*. There are generally obvious alterations in these respects, but they vary considerably, according to both the absolute and relative amount of hypertrophy and dilatation. The walls of the left ventricle may measure from $1\frac{1}{2}$ to 2 inches in thickness; those of the right from 1 to $1\frac{1}{2}$ inches. The septum is usually involved, and tends to bulge towards that cavity which is least implicated. It must be remembered that there may be considerable hypertrophy with little or no thickening of the walls, because it is accompanied with much dilatation. In simple dilatation the walls of an auricle may become so thin as to consist of scarcely anything but pericardium and endocardium, and to be almost transparent. 6. *Physical characters of the heart-tissue*. In hypertrophy, provided degeneration has not set in, the cardiac walls appear either of normal colour or of an unusually bright-red tint, and, as it were, more healthy and robust than normal, while the tissue feels very firm and resistant. Fatty degeneration may, however, give rise to various tints, as well as to diminution in consistence. The heart generally feels soft and flabby in proportion to the degree of dilatation. 7. *Structural changes*. In the form of cardiac hypertrophy now under consideration the *muscular tissue* is increased. It has been held that the previously-existing fibres become enlarged and lengthened; but it is far more probable that there is a new formation, the fibres being augmented in number, and arranged more closely together. Fatty degeneration frequently follows hypertrophy, and it has been supposed that the recently-formed fibres are more liable to undergo this change. The coronary vessels become enlarged, and some observers affirm that the nerves and nerve-ganglia are also increased in size; others believe that there is only a hyperplasia of the connective tissue associated with these structures. The valves of the heart may become hypertrophied in the same ratio as the muscular tissue.

According to the cause of the morbid changes, enlargement of the heart may be general; limited to the left, or less commonly to the right side; to one cavity, especially a ventricle; or even to particular portions of a cavity. As a general statement it may be affirmed that the left side of the heart is more liable to hypertrophy; the right to dilatation. The auricles are probably never solely hypertrophied, being always dilated as well.

SYMPTOMS.—It is for many reasons difficult to indicate precisely what symptoms are directly due to hypertrophy and dilatation in any particular case, and on this part of the subject it must suffice to state the main general facts.

1. *Pure hypertrophy*, provided it is strictly compensatory and no more, may be unattended with any symptoms whatever.

2. In many cases, however, the hypertrophy is *excessive*, and hence gives rise to sensations of the increased cardiac action, both in the heart and in the arteries; as well as to signs of active congestion of the systemic circulation, especially that of the brain, or of the pulmonary circulation, or of both, according as the hypertrophy is left, right, or general: these symptoms being aggravated by whatever tends to excite the heart, such as a little exertion. The undue distension of, and strain upon the arteries resulting from excessive hypertrophy ultimately leads to their degeneration, and it certainly may cause rupture of the cerebral vessels, with consequent apoplexy. It is believed that the pulmonary vessels may undergo degeneration from the same cause, and that they also may give way.

3. If the hypertrophy is *insufficient*, or is associated with *dilatation* or *degeneration*, then the symptoms are more marked. In the first condition there is palpitation, with dyspnoea, especially after any exertion, and now and then irregularity or intermittency of the heart's action is observed. Degeneration is indicated by feebleness of the circulation; irregular cardiac action; and a tendency to syncope. Dilatation will be considered in a separate paragraph.

4. In proportion to the amount of *dilatation* will the functions of the heart be disturbed and its motor force be impaired, so that it becomes more and more difficult to carry on the circulation, which is retarded and rendered languid and thus the mass of the blood is insufficiently aerated, while the capillaries and veins are overloaded, and the arteries are imperfectly filled. Most uncomfortable sensations are often experienced over the cardiac region, which may amount to intense anginal pains. Palpitation, irregularity, or intermittency are either constantly present, or are brought on by slight causes, especially by exertion or flatulence. Dyspnoea is also persistent to a greater or less degree, being easily intensified, and often amounting to orthopnoea; while all the consequences of pulmonary congestion are very liable to arise. The symptoms indicative of general venous congestion are present to their fullest extent, when there is much dilatation of the right cavities. It is important to notice that while in hypertrophy the urine is unaltered, in proportion to the dilatation does it become more scanty and concentrated, and it then usually contains albumin, which may amount to one-eighth or one-sixth of its bulk.

PHYSICAL SIGNS.—In the following description an attempt is made to indicate the chief variations in the *physical signs* which may be met with in the different forms of cardiac enlargement.

1. *Bulging* over the cardiac region is often observed, being in proportion to the degree of hypertrophy; to its duration; and to the youth of the patient. Its seat and extent depend upon those of the hypertrophy. The intercostal spaces may be widened, but are not protruded. Dilatation does not cause bulging.

2. The *impulse* is much altered. In hypertrophy it is usually displaced downwards and to the left, sometimes reaching to the seventh or eighth rib, and three inches or more to the left of the nipple; somewhat increased in area, though well-defined and limited; forcible, in some instances being extremely powerful; slow, impulsive, heaving or pushing in a downward and forward direction; and regular. Dilatation tends to enlarge the impulse transversely, especially towards the right, but does not lower it; it becomes extensive, diffused, and ill-defined; liable to change its place with different beats of the heart; more or less feeble, being sometimes seen when not felt, or perceptible to neither touch nor sight; of jerking or slapping quality, or occasionally almost undulatory; unequal in force, and irregular in rhythm or even intermittent; sometimes double, or with a diastolic impulse. It will be readily understood that according to the degree in which hypertrophy and dilatation are combined will the impulse partake of the characters significant of one or other of these conditions. Further, the part of the heart involved will influence it. When the right side is affected, the chief impulse lies behind and to the right of the sternum and ensiform cartilage, or in the epigastrium; and it appears to be superficial. Hypertrophy about the base of the heart may originate an impulse in this situation; and if either auricle is enlarged, auricular pulsation may be felt over the corresponding region. Valvular diseases and fatty degeneration frequently affect the impulse associated with an enlarged heart.

3. *Cardiac dulness.* In all forms of cardiac enlargement the area of dulness is necessarily increased, but it is important to notice in what directions the increase takes place, as well as the shape of the dulness. Hypertrophy generally enlarges it downwards and to the left, and causes it to assume a vertically-elongated form. Dilatation extends it transversely, especially towards the right, rendering it somewhat square or circular, but does not lower it much. General hypertrophy with dilatation gives rise to the greatest enlargement, both laterally and downwards, the shape being more or less square. It is said that the degree of dulness of hypertrophy is more marked than that of dilatation, and that the sense of resistance is greater, but these characters are by no means reliable. Enlargement of one or other side of the heart will cause the dulness to increase in a corresponding direction; while localized enlargement will give rise to localized dulness.

4. *Cardiac sounds.* In hypertrophy the first sound at the apex becomes obscure, muffled, low-pitched, and somewhat prolonged, the muscular element being in excess. In some cases there can scarcely be said to be a real sound, but rather a sensation conveyed to the head through the stethoscope; and occasionally a sound as of the heart knocking against the chest-walls is heard. At the base the first sound may be much clearer and more valvular. The second sound is often well-accentuated at the base, so as to resemble a first sound. In dilatation the sounds tend to be feeble, but clear, short, sharp, and valvular. The first sound becomes weaker towards the base, but the second may be well-accentuated in this situation. A peculiar sensation is described in simple dilatation, which is communicated through the stethoscope, as of a diffused tumble of the heart against the chest-walls with rolling over, followed by a pause, compared to "the sudden halt of strikers on

an *anvil*" (Richardson); or "to a horse changing its feet while cantering" (Fothergill). Combined hypertrophy and dilatation cause the first sound to become extremely loud, full, prolonged, and accentuated, so as to be heard very extensively; if the valves are also hypertrophied, this sound may have a clanging quality. The sounds will be unusually plain towards the right or left, if either side of the heart is particularly affected; and right hypertrophy is attended with increased accentuation of the pulmonary second sound. Reduplication of the sounds is common in enlargement of the heart.

5. *Murmurs* occasionally result from enlargement of cavities, as already explained. Hypertrophy with dilatation will intensify murmurs due to valvular diseases; and the latter will necessarily modify the sounds above described.

6. An enlarged heart may cause *displacement of neighbouring structures*. The lungs, especially the left, may be pressed upon, dulness and feeble respiration at the base being thus induced. The diaphragm, liver, and stomach may also be depressed.

7. *The pulse*. In hypertrophy involving the left ventricle the larger arteries are generally seen to throb more or less violently, and sometimes the smaller vessels also. The pulse is disposed to be less frequent, slow and prolonged, full, tense, powerful, heaving, incompressible, and regular, having the characters known as constituting the *hammering* pulse. A sphygmographic curve presents a more or less square summit. In proportion to the amount of dilatation the pulse tends to become more feeble, small, compressible, lagging, and irregular or intermittent. When the right side is alone involved the radial pulse is not affected, or only to a less degree, and this may be of assistance in diagnosis. The pulse is often affected by valvular diseases, changes in the vessels themselves, and other causes upon which the cardiac enlargement may depend, or with which it may be associated.

III. ATROPHY OF THE HEART.

ÆTIOLOGY.—Atrophy of the heart may be met with under the following circumstances:—1. As a *congenital condition*, especially in females. 2. In connection with *general wasting* from old age, starvation, low fevers, phthisis, cancer, and other affections inducing marasmus. 3. From *pressure upon the heart* by pericardial agglutinations or effusion; or excessive accumulation of fat. This cause acts partly by interfering with the supply of blood through the coronary vessels. 4. As the result of *disease or obstruction of the coronary arteries*, the heart being on this account imperfectly nourished; atrophy is then generally accompanied with degenerative changes.

ANATOMICAL CHARACTERS.—Diminution in weight is the characteristic feature of cardiac atrophy, and the heart may be reduced in weight to $3\frac{1}{2}$ ozs. or even less. As a rule the heart is small, and its cavities are contracted, the shape being normal. An *eccentric* form is described, however, in which there is dilatation as well as atrophy. The muscular tissue is usually wanting in tone, and fatty degeneration is not uncommon.

SYMPTOMS.—Feebleness of the circulation is the only symptom which

can be attributed directly to atrophy. When it follows pressure upon the heart or interference with its supply of blood, severe symptoms are often present, such as palpitation, dyspnoea, and general venous congestion; but these are not the immediate consequences of the atrophy. The *physical signs* are:—1. A feeble and limited apex-beat, which may be raised. 2. Diminished area of dulness. 3. Weak or sometimes almost extinct sounds. 4. Pulse small, feeble, but regular.

IV. FATTY DISEASES OF THE HEART.

There are two distinct pathological processes in connection with the heart to which the term *fatty disease* is applied, each requiring separate consideration.

1. Fatty Infiltration.

ÆTIOLOGY.—Fatty infiltration is observed:—1. As a part of *general obesity*, especially in elderly persons. 2. In some individuals who suffer from cancer, phthisis, and other *wasting affections*. 3. In connection with *chronic alcoholism*.

ANATOMICAL CHARACTERS.—There is an infiltration of the connective-tissue cells around and in the substance of the heart with fat, leading to a kind of *fatty hypertrophy*. This commences under the pericardium, but the fat penetrates inwards between the muscular fibres, causing their degeneration and absorption, so that finally the affected portions of the cardiac walls may be almost or entirely composed of adipose tissue. The ventricles are chiefly affected, especially the right, and there is a particular tendency to the accumulation of fat along the sulci, and about the base and apex. The tissue is necessarily pale, soft, flabby, and lacerable.

SYMPTOMS.—Fatty infiltration may generally be suspected when it exists, but in many cases it cannot be made out by positive signs. If considerable in amount, it is liable to be accompanied with uncomfortable sensations in the cardiac region; palpitation on exertion; shortness of breath; and a weak and languid circulation, leading to incapacity for any effort, chilliness of the extremities, and a tendency to giddiness or faintness. *Physical examination* only reveals a feeble impulse and sounds; and a weak, compressible pulse. Often, however, there is so much fat over the chest as to render the local signs mentioned quite unreliable.

2. Fatty Degeneration or Metamorphosis.

ÆTIOLOGY.—The pathological modes of origin of fatty degeneration of the cardiac walls are as follows:—1. In the large majority of cases it results from mal-nutrition, owing to some interference with the supply of blood through the coronary arteries. This may arise from atheroma or calcification of the vessels themselves; embolic obstruction; external compression, especially by pericardial thickening; or, according to some writers, impairment of the force of the aortic recoil from any cause. A hypertrophied or dilated heart is very liable to degenerate,

chiefly in consequence of inadequate blood-supply. 2. This disease is sometimes a part of a general tendency to fatty changes, which are observed at the same time in the kidneys, lungs, vessels, cells of the cornea, and other structures. These changes may be set up without any evident cause; or in connection with senile decay, alcoholism, gout, and lowering diseases, such as phthisis or cancer. Most authorities regard them as being the result of some unhealthy condition of the blood; but it has been suggested that the trophic nerves are at fault. Some are of opinion that the heart and other structures may become fatty in consequence of renal disease, which renders the blood impure. 3. More or less fatty degeneration is associated with fatty infiltration, and it may follow myo-carditis. 4. The heart has been found to have undergone fatty degeneration in cases of poisoning by phosphorus, as well as by phosphoric and several other acids. 5. It has been suggested that disease of the cardiac ganglia and nerves may lead to fatty degeneration.

Predisposing causes.—The most important of these are age, fatty degeneration of the heart being very uncommon in the young, and increasing in frequency after middle life to about the sixty-third year (Watson), after which it gradually becomes less common; the male sex; sedentary and indolent habits, especially when combined with over-eating and drinking, this disease being hence said to be more common among the higher classes, and in those whose occupations lead to the above habits, such as publicans or butlers; and the presence of gout or Bright's disease. Neither general obesity nor the opposite condition seems to have any influence.

Allusion may here be made to the condition which has been specially named the "Gouty Heart."* It is really merely hypertrophy followed by fatty degeneration of the cardiac walls, associated with changes in the vessels and in the kidneys, occurring in connection with lithæmia.

ANATOMICAL CHARACTERS.—Fatty metamorphosis may be observed in a heart of normal size, or in one enlarged or atrophied. The ventricles are by far most frequently affected, especially the left; and the change may be seen over a considerable extent, or be limited to certain parts if due to localized obstruction. It may commence primarily at either surface, or deep in the walls.

The alterations in *physical characters* are marked if the degeneration is advanced. The colour is paler than normal and dull, either brownish-red, pale brown, or presenting various "faded-leaf" tints, being sometimes actually yellow. These colours may be seen throughout, or merely in streaks. The consistence is diminished, the tissue tearing and breaking down readily under pressure, and the cardiac walls occasionally resembling mere "wet brown paper." There may be a greasy feel, oil being yielded on pressure, or to the knife, blotting-paper, or ether.

The *microscopic changes* are characteristic, and may be observed before there are any alterations evident to the naked eye. At first the striæ of the muscular fibres are merely rendered indistinct by fat-granules and oil-globules, being again brought into view by ether. Gradually

* For full details see "The Heart and its Diseases," by Dr. Milner Fothergill, 2nd edition, p. 400.

they become more and more obscured, until finally they disappear altogether, the fibres being made up entirely of fat-granules. Some are of opinion that fat is formed between as well as within the fibres.

SYMPTOMS.—Undoubtedly fatty degeneration may exist without there being any clinical indications of this condition, or only such as are of doubtful significance. Sudden death has occurred from this disease, when there had been no previous suspicion of any cardiac mischief. Cases, however, come under observation not uncommonly in which the diagnosis may be made with tolerable positiveness. As a rule the progress of the disease is very gradual and insidious. Most of the symptoms are attributable to the feeble action of the heart.

Unpleasant sensations are frequently complained of over the cardiac region, and anginal attacks are very liable to arise. Palpitation is often felt during the progress of the degeneration, not, however, directly associated with the diseased fibres, but with those which are unaffected, these being insufficient to carry on the circulation. The principal disturbances of the cardiac action observed in different combinations are infrequency, the beats being reduced to 50, 40, 30, 25, or even less in a minute; feebleness; irregularity; and intermittency. Any exertion tends to increase the frequency, and to render the action more irregular.

The appearance of the patient may afford signs of the disease. There is not infrequently a sallow earthy tint, combined with anæmia, or with lividity about the lips and enlarged capillaries on the cheeks, of which appearances I have met with well-marked examples. Fothergill describes the skin as sometimes resembling discoloured parchment, having a greasy feel and presenting changes in the epidermis. The tissues are generally flabby and wanting in tone. There are frequently evidences of degeneration in the vessels and other structures. Among these the *arcus senilis* has been considered of material diagnostic importance, especially when it is yellow, ill-defined, and passes into a cloudy cornea; but this is very questionable.

The patient feels weak and languid; deficient in vitality; subject to chilliness; and incapacitated for any exertion, which brings on shortness of breath, faintness, or actual syncope. Involuntary sighing is sometimes a prominent symptom, and also the peculiar disturbance of breathing described by Cheyne.

Owing to the inadequate supply of blood to the nervous centres important symptoms arise. The chief of these are habitual depression of spirits; irritability and moroseness; various sensations in the head; disturbances of vision; feebleness of intellect, with failure of memory, and inaptitude for thought; tremulousness and an unsteady gait; a tendency to sudden attacks of giddiness, which make the patient cling to the nearest object; restless and disturbed sleep, attended with sudden startings, which may be due to a feeling of impending suffocation; and unusual sensations in the limbs. Sudden cerebral anæmia is very liable to occur, inducing syncope; apoplectiform or epileptiform attacks; or a combination of these conditions. These attacks are, however, soon recovered from as a rule, and do not leave any permanent ill-effects behind.

The digestive organs are generally out of order. A sensation of

sinking in the epigastrium is often complained of. Sexual inclination and power are often notably deficient.

It must be borne in mind that fatty degeneration may set in in connection with a hypertrophied or dilated heart, or with valvular disease, and it will then modify the symptoms as well as the physical signs accompanying these conditions, especially adding to the difficulty in carrying on the circulation.

PHYSICAL SIGNS.—The only positive signs of fatty heart are the following:—1. The *impulse* is feeble or absent, but if perceptible it is well-defined. 2. The *sounds* are weak, especially the first, which may be almost inaudible, particularly at the base, where it is weaker than at the apex. The second sound may be fairly accentuated. 3. The *pulse* is very feeble, small, and compressible; often infrequent, there being sometimes but one pulsation to two ventricular contractions; while it tends to be irregular, and may become hurried paroxysmally, so as to be almost uncountable from its frequency and irregularity (Walshe).

COURSE AND TERMINATIONS.—Patients suffering from fatty disease of the heart may go on for years, but death is to be feared at any moment if the lesion is advanced. The fatal termination may occur quite suddenly from syncope, usually after some effort; rupture of the heart, either sudden or gradual; or cerebral anæmia: or gradually from asthenia, which may be attended with dropsy. This symptom, however, is often absent from first to last, even in extreme cases, and it is a question whether fatty disease alone can give rise to dropsy.

V. PECULIAR DEGENERATIONS AND NEW FORMATIONS IN THE WALLS OF THE HEART.

In addition to the fatty degeneration just described, it is requisite to mention the following:—1. *Softening* of the tissue of the heart in connection with low febrile conditions, especially typhus, typhoid, small-pox, scarlatina, and septicæmia from any cause. A form of simple softening has also been described, chronic in its course. 2. *Brown atrophy* of the heart. 3. *Fibroid infiltration* or *degeneration*, or so-called *cirrrosis*. This is localized, especially in the muscoli papillares, but it may form scar-like patches in the walls. In some cases it results from inflammation; but in others it seems to be a gradual change, from proliferation of an imperfect fibroid tissue; or some believe there is an actual infiltration of material between the muscular fibres. 4. *Calcification*. 5. *Syphilitic growths*. 6. *Albuminoid degeneration*. 7. *Cancer*, which is extremely rare, being usually medullary and nodular. 8. *Tubercle*, also very rare. 9. *Parasitic formations*, viz., the cysticercus cellulosus, and the echinococcus hominis.

VI. CARDIAC ANEURISM.

Cardiac aneurism signifies a localized dilatation of the walls of the heart. It may involve the entire thickness, or the endocardium and

contiguous muscular strata may be destroyed. The size and form of the aneurism vary much, but there are the two types of general and equable dilatation of a portion of the parietes; and the sacculated variety, the latter opening into the heart by a wide or narrow orifice. More or less stratified fibrin or coagulated blood is usually found in the sac, and it may thus be completely obliterated, and the aneurism cured. The left ventricle is almost invariably affected, and more than one aneurism may be present.

Cardiac aneurism is almost always the consequence of some previous structural change in the ventricular walls, especially fatty or fibroid degeneration; inflammation; softening from any cause; rarely ulceration or rupture of the endocardium; or hæmorrhage into the muscular structure. As a rule it is formed gradually, but may be developed suddenly from violent strain. Fibroid and other degenerative changes are likely to be increased, or to be subsequently set up at the seat of aneurism.

SYMPTOMS.—There are no reliable symptoms or signs of aneurism of the heart. Sometimes a localized pulsating prominence is observed, over which a single or double murmur may be heard. Hypertrophy and dilatation are developed in course of time. Death may take place suddenly from rupture of the aneurism.

VII. RUPTURE OF THE HEART.

ÆTIOLOGY.—This rare lesion may be considered in this chapter, as the rupture is generally the result of some chronic structural change in the cardiac walls, and probably even in traumatic cases they are never quite healthy. The more important morbid conditions which have been observed are fatty disease, especially degeneration; great dilatation; cardiac aneurism; abscess or gangrene; ulcerative or other destruction of the endocardium; hæmorrhage into the walls; calcification; and parasitic formations. Rupture of the heart may occur in connection with aortic aneurism or coarctation, but then its walls are probably always diseased as well. It almost invariably results from some exciting cause, being rarely spontaneous; while it is by far most frequent in males and old persons.

ANATOMICAL CHARACTERS.—The size, shape, and other characters of the rupture vary considerably. On the whole it is much more frequent in the left ventricle, but traumatic rupture is more common on the right side. The direction of the laceration is generally parallel to the chief fibres of the heart.

SYMPTOMS.—These vary according to the mode in which the rupture takes place, and its dimensions. Death may be instantaneous, or very rapid after sudden insensibility preceded by a shriek. If this does not happen, the important symptoms are sudden extreme pain in the cardiac region; a sense of great oppression and dyspnoea; signs of intense shock and collapse; and indications of grave interference with the cardiac action. Patients occasionally rally, and there may be repeated attacks, supposed to indicate rupture of successive layers of the heart's fibres. It is even stated that recovery may take place.

CHAPTER VI.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF
CHRONIC CARDIAC AFFECTIONS.

I. DIAGNOSIS.

IN making a diagnosis with regard to chronic affections of the heart, it is necessary to determine :—1. Whether there is any actual organic mischief, or merely functional disturbance, which gives rise to symptoms associated with this organ. 2. The nature, exact seat, and extent of any organic disease present, the main conditions to be borne in mind being :—*a.* Diseases of the valves and orifices. *b.* Alterations in the size or capacity of the heart. *c.* Changes in its walls. *d.* Interference with its supply of blood. *e.* Pericardial effusion or adhesion. It must be remembered that these lesions are often variously combined, and an endeavour should be made to determine the precise state of the structures in every particular just mentioned. 3. The pathological cause of any existing lesion, if this can be discovered.

A separate account of the diagnosis of each disease would involve unnecessary repetition, and it will be sufficient to indicate the data on which this should be founded, these being :—1. The *previous history* of the patient, special inquiry being made with regard to *acute rheumatism* and *violent exertion*. It may also be of some help to note whether there is any family predisposition to cardiac disease. 2. The *age, sex,* and *general condition*, particularly observing whether there are signs of degeneration. 3. The *symptoms* present, especially noting any disturbance of the circulation, and the phenomena resulting therefrom. 4. The *physical signs* discovered on examination. Physical examination is the only positive and reliable means by which cardiac diseases are diagnosed, and daily experience enforces the importance of investigating the state of the heart in any case which comes under observation for the first time, and especially when examining for life-insurance. The points to be attended to in this examination are :—(i.) Whether there is any change in the shape or size of the chest over the cardiac region. (ii.) The characters of the impulse in every particular. (iii.) Whether any thrill or pericardial fremitus can be felt. (iv.) The position, form, direction, and extent of the cardiac dulness. (v.) The characters of the heart-sounds, these being compared over different parts of the cardiac region. (vi.) Whether any pericardial or endocardial murmur can be detected, with the characters of such murmur. It is also requisite to examine carefully the arteries and veins, making use of the sphygmograph when necessary in connection with the former, and observing whether these vessels present evidences of degeneration.

It is important to draw attention to the following facts :—1. The heart may be displaced by extrinsic conditions, thus presenting abnormal physical signs when it is not itself actually diseased; while signs of organic mischief may be modified by the state of contiguous structures. 2. Murmurs may belong to the inorganic class; or may be merely due

to roughness of the endocardium, which is unattended with any danger. 3. The bulging and dulness indicative of pericardial effusion or cardiac enlargement may be simulated by excessive temporary distension of the right cavities of the heart; aneurism of the aorta; tumour, abscess, or accumulation of fat in the mediastinum; localized pleuritic effusion; consolidation or retraction of the anterior edges of the lungs, especially the left. 4. Organic disease, even of a serious nature, is not unfrequently unattended with any symptoms whatever; and there may be no distinctive physical signs, particularly in the early stage of degeneration. 5. Severe cardiac symptoms may be complained of, and there may even be marked objective disturbance of the heart's action, amounting to irregularity or intermittency, in connection with mere functional disorder. Much stress has been laid on certain points in making out whether local cardiac symptoms are due to organic mischief or not, viz., that mere functional disturbance is not increased by effort; is inconstant; and is usually brought on by some obvious exciting cause. My own experience would lead me to avoid placing any implicit reliance on such distinctions, except that grave disorder of the cardiac action following slight exertion may be an useful sign indicative of degeneration.

II. PROGNOSIS.

Any organic affection of the heart should be regarded as serious, but numerous circumstances influence the prognosis, and every case has to be considered in several aspects before a satisfactory opinion on this matter can be given. It must be premised that great care should be exercised against mistaking mere functional disorder for organic disease and *vice versa*, which might lead to a wrong prognosis in either direction, and it is therefore highly improper to attempt to found any conclusion on mere subjective symptoms.

The questions which have to be considered in any particular case of heart-disease are mainly these:—1. Whether there is any danger of sudden death? 2. What are the events likely to arise in the progress of the case, and the dangers to be feared? 3. What will be the probable duration? 4. Whether a cure is possible? In the following remarks an endeavour will be made to indicate the chief matters to be attended to in order to arrive at a correct conclusion on these questions; and to state the principal facts which experience has established.

1. The prognosis must necessarily be guided by the **nature, seat, and extent** of the disease or diseases present, the knowledge of these facts being of course founded on a satisfactory physical examination. Instances are met with occasionally in which a murmur arises from mere roughness of the endocardium; in such cases there is not much danger, except that the mischief might spread to the orifices and valves or their appendages. Any organic affection in connection with either orifice, inducing obstruction or regurgitation, is decidedly serious, but the dangers are of a very different character at the different orifices, and depend further upon the cause of the lesion, and the exact conditions present. In estimating the probable evils, moreover, the effects of the various lesions upon the circulation must be borne in mind, as well as the secondary changes which they are likely to originate in the heart.

With regard to *sudden death*, *aortic regurgitation* is the only form of valvular disease in which this event may be anticipated with any probability, but it is said to have occurred in exceptional cases of *mitral regurgitation*. *Obstructive disease* in connection with the left orifices is mainly injurious by its "back-working," and by its consequent effects on the heart, lungs, and circulation. *Aortic obstruction* often lasts a long time without producing any particular mischief; and cases of *mitral constriction* also frequently go on for a considerable period. *Mitral disease* is more immediately dangerous on account of its effects on the lungs. *Tricuspid regurgitation* is one of the most serious affections of the orifices, on account of the distressing symptoms by which it is certain to be followed in course of time, and often very speedily, through over-loading of the venous circulation; but its progress is frequently slow and tedious, the patient leading a miserable existence. *Pulmonary constriction or regurgitation* produces the same effects, but less rapidly. It will readily be understood that extensive or double disease at an orifice increases the gravity of the prognosis. As a rule also it is worse when two or more orifices are involved; but secondary implication of an opening sometimes gives temporary relief, as in the case of tricuspid regurgitation following mitral disease, which diminishes the severity of the pulmonary symptoms.

With respect to the question whether valvular disease is ever curable, I certainly have met with cases in which marked mitral constrictive murmur has disappeared entirely in young persons; and, though complete restoration to the normal condition is probably not possible, it is not unlikely that inflammatory deposits leading to both aortic and mitral obstruction may be partly absorbed or removed in course of time.

Hypertrophy in the majority of cases is decidedly a preservative or compensatory lesion, and cannot under such circumstances be looked upon as of evil import. It is dangerous only when excessive, as it may then lead to rupture of vessels, especially if these are diseased, a condition which it tends itself to produce through constant over-distension: when on the right side it is further injurious through keeping up a persistent state of active congestion of the lungs. Some authorities are of opinion that hypertrophy may subside if the cause which has induced it can be removed.

Dilatation is a highly dangerous condition, and in proportion to its degree and to its excess over hypertrophy does the prognosis become worse. Sudden death may occur in connection with a weak, flabby, greatly dilated heart; while dilatation always materially augments the difficulties experienced in carrying on the circulation, thus contributing to the developement of dropsy and other serious symptoms.

Degeneration of the heart's walls, especially fatty disease, is another very grave lesion. It is when this change sets in that the prognosis becomes so much worse in cases of compensatory hypertrophy. Extensive fatty degeneration is one of the most frequent causes of sudden death from cardiac disease.

Pericardial agglutinations add much to the evils of other cardiac diseases, and also tend to originate changes in the heart itself. I have observed some cases in which this condition seemed to have consider-

able influence in bringing about a fatal termination in connection with pneumonia.

In many cases the cardiac affections just alluded to are variously combined, and the prognosis has then to be determined from a careful consideration of the exact lesions present.

2. The existing **symptoms** will influence the prognosis considerably. Severe anginal attacks; great irregularity or intermittency of the cardiac action; or a tendency to syncope or to apoplectiform or epileptiform seizures, increase the danger of a case very materially. When the general venous circulation becomes much interfered with, and dropsy sets in, the duration is not likely to be very prolonged; it is impossible, however, to make any definite statement on this matter, as patients often linger on for a considerable time, and may even improve remarkably under appropriate treatment. It is important to notice further that acute pulmonary complications may arise, and cause very serious symptoms, at the same time materially increasing the dropsy, so that the case appears to be approaching a speedy termination; but, on the subsidence of these complications, great improvement may take place, the patient again rallying for a time, and sometimes even feeling better than before.

3. The **cause** of any organic disease may influence the prognosis, as well as the possibility of removing such cause. For instance, improvement in valvular disease can be hoped for only when it results from acute inflammation; if induced by chronic and degenerative changes, matters always tend to become worse. After a sudden injury to a valve, the lesion does not tend to increase, but usually remains static, whereas after valvulitis progressive changes are likely to take place, which derange more and more the functions of the structures connected with the affected orifice. As has been previously stated, some authorities regard a certain degree of hypertrophy, or even of dilatation, as capable of being completely cured, if the cause can be removed.

4. The **state of other organs and structures**, especially of the lungs, kidneys, and arteries, will considerably modify the prognosis in any given case, and hence their condition ought to be carefully investigated. If the vessels are much diseased, the muscular tissue of the heart is very likely to undergo speedy degeneration.

5. Among **general matters** affecting the prognosis are the age of the patient; the family history, as indicating a tendency to death from heart-disease at any particular time; and the social position and habits of the patient. It is only in young persons that curative changes can be at all expected. Those who are so circumstanced that they are able to live quietly, without either the anxiety or the labour arising from having to provide day by day for themselves and their families, and who can procure a suitable diet, have a much better chance of length of life than those not so fortunately situated. Laborious occupations are especially hurtful. Continuance in injurious habits, such as intemperance or debauchery, will necessarily render the prognosis more unfavourable. The prognosis of cardiac diseases with reference to marriage, parturition, and suckling is of much importance, and those who are interested in the subject will find valuable information in the recent work by Dr. Angus Macdonald on "Heart Disease during Pregnancy."

III. TREATMENT.

Very seldom can any hope be entertained of curing a chronic cardiac affection, but undoubtedly much may be done in the way of prolonging life; averting further mischief in the heart; warding off unpleasant or dangerous symptoms; and relieving such symptoms when they arise. After any acute affection involving the heart, the patient should be kept strictly under observation, until this organ has been restored to as normal a condition as possible; while any chronic case ought to be kept constantly under medical supervision, though this does not imply that medicines must be persistently given. Different forms of heart-disease require particular modifications in their management; but it will suffice here to point out the main principles which apply to all cases more or less; and, as occasion requires, to call attention to any special treatment which needs to be commented upon in connection with particular affections.

1. **General management** is always of essential importance. A patient suffering from heart disease should, if possible, give up any laborious employment, especially if this has evidently originated and is increasing the mischief. At the same time warning should be given against all forms of severe exercise, particularly such as involve sudden effort; and it is well to give special instructions against running or walking hurriedly, or straining at stool. In some instances complete rest should be enforced for a time, which often produces a marked improvement in the state of the heart. Many cases, however, are benefited by more or less exercise, or at all events by being in the open air during some portion of the day, and carriage driving is often useful. Many patients are able to go about their usual avocations without any harm resulting, provided these are of a satisfactory character. The question of the amount of exercise to be permitted must be determined by the actual conditions present, and the effects which follow it; it may be stated generally, that in proportion to the degree of dilatation or degeneration present is the capacity for effort diminished. These lesions, if extensive, as well as aortic regurgitation, imperatively forbid any great exertion. It is very important further to avoid all causes of mental disturbance. Anxiety and mental strain or excitement in connection with pecuniary matters, business, politics, or excessive study, as well as everything which may rouse strong emotion, must be carefully shunned, and a proper amount of sleep should be habitually obtained. Warm clothing is requisite, but there must be no pressure or constriction about the chest or neck. Cold or tepid sponging of the skin is often useful if it is well borne. All injurious habits which depress the nervous energy of the heart must be prohibited, such as abuse of alcohol, tobacco, or tea, late hours, or venereal excesses; and close inquiry may be necessary with regard to various matters in order to detect such mischievous habits. Change of air to a moderately warm and rather bracing climate frequently proves beneficial.

2. It is most needful to attend to the **diet** in every particular, and to the state of the **digestive organs**. When there is degeneration of the heart a very nutritious diet is indicated, which should contain

abundant protein elements, if these can be digested, but anything indigestible must be avoided. Milk and cream are exceedingly useful articles in many cases. With regard to alcoholic stimulants, no rule can be laid down, but a moderate amount is generally beneficial, and there are not unfrequently symptomatic indications calling for considerable quantities. The bowels should be kept acting regularly. Remedies for improving the tone of the stomach and relieving dyspeptic symptoms are frequently very serviceable, and this applies especially to flatulence, which mechanically interferes with the heart's action.

3. If there is any **constitutional diathesis**, such as gout or syphilis, treatment directed against such a condition is often beneficial. One of the most essential matters in many cases of cardiac disease is to look to the state of the **blood**, and should there be any indication of anæmia, to give some preparation of iron. Indeed, independently of this condition, this drug is frequently of considerable value, especially in the form of tincture of steel. Other *tonics* are useful in many cases, such as quinine and mineral acids, strychnine or tincture of nuxvomica, particularly if the heart is in a state of degeneration, or is wanting in tone.

4. Excellent therapeutic observations have been carried on during the last few years, in order to determine the effects of certain powerful **medicinal agents** upon the heart. Of these digitalis requires special notice. Experiments have shown that the effects of digitalis upon the heart are not to paralyze it, as was formerly supposed, but to render the ventricular contractions more powerful and complete, less frequent, and more regular. Hence the periods of rest between the contractions are longer; the blood is driven more forcibly and in greater quantity into the aorta; the aortic recoil is promoted; and thus the nutrition of the cardiac walls improved (Fothergill).

There are considerable differences of opinion as to the cases in which digitalis is indicated, and as to its most useful mode of administration. The following remarks may serve to convey the main practical facts with regard to the employment of this drug, partly founded on the statements of others, partly on personal clinical observation.

(i.) In all cases in which digitalis is given, its effects should be carefully watched, especially as regards the cardiac action; the state of the pulse; the urine; and any dropsy which may be present. When the action of the heart is rapid, irregular, ineffective, or embarrassed, the pulse being at the same time weak, the good results of the use of digitalis are seen in that it calms the heart and makes this organ act regularly and more vigorously, often relieving unpleasant local sensations; while the pulse is simultaneously improved, becoming less frequent, stronger, fuller, and more regular. Intermittency has been considered by some as contra-indicating digitalis, but though more than usual caution is required under such circumstances, it may be given in many cases with excellent results, and Fothergill is of opinion that it sometimes indicates a necessity for increasing the dose. If it appears to induce irregularity or intermittency, with much feebleness of pulse, digitalis should be discontinued. The urine is often much increased in quantity by its use, but only if dropsy is present (Ringer). Should it become diminished, this is considered an indication for stopping the

drug. Its diuretic action is presumed to be due to the force of the heart being increased, and through this the arterial tension in the kidneys, by which the flow of water out of the renal vessels is promoted. The influence of digitalis on cardiac dropsy is often most marked, but not invariably. As signs which suggest the discontinuance of digitalis may be mentioned exaggeration of unpleasant sensations about the heart, if evidently due to the drug; tendency to faintness; noises in the head; and persistent vomiting. It has been supposed to have a cumulative action, and may thus give rise to sudden symptoms of poisoning.

(ii.) Digitalis is given chiefly in the form of the tincture or infusion, some practitioners preferring one, some the other. If the remedy is required to act rapidly upon the heart, and especially to diminish dropsy, the freshly-made infusion is certainly preferable; but the tincture is very useful for continuous administration. The powder of the leaves is also recommended when it is required to keep up the action for some time, and if it cannot be taken internally, external applications of poultices of the leaves or fomentations of the infusion may act beneficially, especially in promoting the flow of urine and diminishing dropsy. Digitaline has also been used, either internally or by subcutaneous injection. It is generally advisable to begin with a small dose (3ss—3i of infusion, or m̄v—x of tincture three or four times daily), and gradually increase the quantity, as well as the frequency of administration, according as circumstances indicate. Digitalis is advantageously combined with other medicines, especially iron, various *tonics*, and *diuretics*. It may be necessary to continue the medicine for a long period, even for years; but it has appeared to me that it is in many instances preferable to intermit its administration from time to time. In the less advanced cases it often brings about such good results that it can be left off for considerable periods, but it should be resumed as soon as there are any signs of disturbed cardiac action. In very advanced cases attended with general dropsy the drug may lose its power, and the dose has often to be increased considerably in order to produce any effect, which is a bad omen.

(iii.) The cases in which digitalis is indicated or the reverse must now be noticed. Simple hypertrophy of the left ventricle only requires the drug when excessive, and when the heart is acting tumultuously; or when the hypertrophy is insufficiently compensatory. The dose should be very small, and the effects closely watched, as symptoms of poisoning may speedily arise in these cases. In proportion to the degree in which dilatation becomes evident, and the heart's action is consequently inefficient, does the remedy generally become more valuable, much larger doses being required and being well borne. Mitral disease and changes in the heart resulting therefrom are greatly benefited as a rule, the pulmonary and other symptoms associated with these conditions being also effectually mitigated. It is especially when there is great irregularity that digitalis proves so serviceable, and Ringer believes that the drug causes the muscoli papillares to act more regularly, thus checking regurgitation which depends upon their disturbed action. Many object to the use of digitalis when the aortic orifice is involved. I quite agree with those, however, who do not look

upon this as a contra-indication, provided the state of the ventricle is such as to require it, having frequently seen marked benefit follow its administration, but these cases must be closely watched. The conditions due to enlargement of the right heart with tricuspid regurgitation, when this lesion exists alone as the result of pulmonary disease, are not improved by digitalis unless there is irregularity in the cardiac action, and the drug may even do harm; when these morbid changes follow mitral disease, however, much good may be effected by its use.

Fatty degeneration is also looked upon by many as contra-indicating the use of digitalis; but, with due precautions, I am convinced that it may be given with undoubted benefit when this condition is present, should it be called for; and it then probably acts by aiding the contraction of those fibres which still remain healthy. Extensive atheroma has likewise been regarded as forbidding the employment of this drug, and it certainly ought to be used with particular care when the arteries are much affected. Bronchitic attacks associated with heart disease may be often much relieved by the use of digitalis, should there be palpitation, irregularity, or other signs of cardiac embarrassment and inability. Its value in functional palpitation has already been alluded to.

Several other powerful remedies influence the heart, namely, aconite, belladonna (both of which are very valuable in calming this organ when it acts excitedly and violently), casca, strychnine, hydrocyanic acid, veratria, caffeine, scoparium, and squill. Some of these drugs require to be given cautiously, as they are powerful agents.

5. Important questions suggest themselves, as to whether any means are known capable of restoring the heart to its normal condition when in a state of disease; and whether it is desirable to use such means? As regards valvular diseases, it is useless to attempt to influence these by any therapeutic measures. With respect to the diminution in size of a hypertrophied heart, this is certainly not what ought to be aimed at, and it is more than doubtful whether such enlargement can be affected in the least by any known remedies; such measures towards this end as repeated local bleedings, low dieting, severe purgation, and large doses of iodide of potassium, are decidedly to be condemned, and the great object should rather be to maintain the nutrition of the heart as much as possible, and to prevent it from becoming dilated or undergoing degeneration. There are no direct means of influencing dilatation, except by improving the tone and vigour of the heart by administering good food, tonics, and digitalis. It is quite possible that the nutrition of a fatty heart may be improved in some instances by nourishing diet, tonics, and cod liver oil.

6. Various **symptoms** are liable to arise in the course of a case of heart-disease, demanding measures for their relief. Those more immediately connected with the heart are pain and other unusual sensations; palpitation; angina pectoris; and faintness or syncope. Abnormal sensations are often much relieved by wearing a belladonna plaster, and many patients are never comfortable except when they have one applied. Sometimes belladonna liniment is very useful. The treatment of the other symptoms has already been pointed out. With regard to palpitation attended with dyspnoea, this is in some instances much quieted by the subcutaneous injection of a very small quantity (gr. $\frac{1}{12}$ to $\frac{1}{4}$) of

morphia, which is supposed to relieve spasm of the arterioles, this being the cause of the palpitation (Fothergill). Aconite in minute doses is also strongly recommended by Ringer and others. Pulmonary symptoms must be treated by the usual remedies, but they are often greatly relieved by digitalis. Needless cough should decidedly be subdued, though it is frequently necessary to promote expectoration. Cardiac dyspnoea may in many cases be relieved by digitalis, or it may require various *sedatives* and *antispasmodics*. Any obvious cause giving rise to this symptom, such as flatulence, should be at once got rid of, and it is generally diminished by enabling the patient to sit up in bed, thus removing any pressure on the diaphragm from below. In some cases the patient cannot remain in bed, and must be allowed to sit propped up in an arm-chair, which may be fitted with a rest for him to lean forward upon. Hæmoptysis occurring in heart-disease should not be rashly stopped, provided there is not sufficient loss of blood to injure the patient, as it may afford considerable relief.

Local remedies are often serviceable in the treatment of heart and lung symptoms, such as dry-cupping, hot or turpentine fomentations, and sinapisms. Some recommend irritation along the course of the vagus nerve, by means of sinapisms or gentle galvanism. In cases where the symptoms are severe, and where there is evidence that the right cavities of the heart are greatly over-distended, removal of blood may prove decidedly serviceable for the time, either by venesection, local cupping, or application of leeches; but it must be remembered that this measure tends to induce anæmia, and to impair the nutrition of the heart, and thus may ultimately do more harm than good, so that all the conditions present should be carefully considered in every instance before proceeding to its adoption.

Dropsy is a symptom which sooner or later sets in in a large proportion of cases of heart-disease. In its treatment those *diuretics* are most beneficial which act upon the heart, and thus increase the arterial tension in the kidneys, especially digitalis. Well-diluted gin, hollands, and whisky are also useful as diuretics. Vapour, hot-air, or even Turkish baths are highly beneficial when they can be borne, and with due precautions they may be persevered in for some time. I have frequently found much benefit from the employment of local baths, by wrapping up the legs in warm fomentations along their whole extent, and covering them with mackintosh. It has also been recommended to excite the skin into activity by surrounding the patient with hot-water bottles while in bed. Purgation is often attended with beneficial results, but this mode of treatment requires care, on account of the depression which may thus be induced. Frequently it is not desirable to check diarrhoea in cases in cardiac dropsy, as it helps to unload the vessels; and it may be allowed to continue, provided the patient is not evidently lowered from its excessive amount. With respect to operations for the removal of dropsy associated with heart-disease, if anasarca is considerable in amount and does not soon yield to proper treatment, acupuncture or the use of Southey's trochars should decidedly be resorted to, in my opinion, for I have often observed great relief follow the adoption of these measures. Of course due regard must be paid to position and cleanliness.

Much difficulty is frequently experienced with regard to procuring sleep in advanced cases. Opiates, hydrate of chloral, bromide of potassium, and other remedies of this class are frequently dangerous, as they tend to induce a condition in which the voluntary efforts necessary for carrying on respiration are suspended, and death might speedily ensue. Still in many such cases they must be given, or it may be justifiable to try small injections of morphia, stimulants being given freely at the same time. When the patient becomes semi-comatose from carbonic acid poisoning, the bladder must be regularly emptied.

7. It is necessary to attend to the state of the other principal organs of the body when the heart is affected, and, as far as possible, to prevent them from becoming involved, especially the lungs, kidneys, and liver. Every source of cold should be particularly avoided, and the slightest pulmonary complaint must be attended to and treated without any delay. An occasional dose of some medicine which acts upon the liver may be useful.

CHAPTER VII.

MALFORMATIONS OF THE HEART AND GREAT VESSELS—CYANOSIS—BLUE DISEASE.

THE term *cyanosis* merely indicates a peculiar appearance presented by a patient, which is especially observed in connection with malformations of the heart and great vessels, but is often associated to a greater or less degree with other affections which obstruct the circulation, and interfere with the due aëration of the blood.

ÆTIOLOGY.—The *pathological causes* of cardiac malformations are in the great majority of cases either :—(a) *Arrested developement*; or (b) *Endocarditis* or *myo-carditis* occurring during intra-uterine existence, which is by far more common on the right side, especially in connection with the pulmonary orifice. Possibly some forms of malformation may in very exceptional instances be acquired after birth, in consequence of the rupture of a septum.

ANATOMICAL CHARACTERS.—The following are the chief morbid conditions met with in the heart and great vessels, which come under the class of *congenital malformations*, excluding some which are merely of anatomical interest, and do not give rise to any ill-effects :—

I. Cardiac. 1. Patent foramen ovale, or even complete absence of the auricular septum. 2. Perforation or incomplete developement of the ventricular septum. 3. Owing to the above-mentioned conditions being carried to an extreme degree, there may be but one auricle or ventricle; or sometimes an auricle and ventricle are thrown into one; or there may even be scarcely any separation between either of the cavities. 4. Extreme smallness of the right ventricle, either, from the septum lying too much in this direction, or from cicatricial thickening and stricture. This condition is in very rare instances observed on the left side. 5. Constrictive disease of the tricuspid orifice, or contraction of the

valves, leading to obstruction or regurgitation. The same conditions are said to be met with, but only extremely exceptionally, in connection with the mitral orifice.

II. Vascular. 1. Constriction or incomplete developement of the pulmonary artery. In an interesting case which came under my notice, only the right branch of the pulmonary artery existed, which was quite pervious, but the valves were extensively diseased and calcareous, the left lung being completely collapsed and disorganized. 2. Constriction or coarctation of the aorta. 3. Transposition of the arteries, the aorta coming from the right ventricle, and the pulmonary artery from the left. 4. Both vessels may spring either entirely or partially from the same ventricle, owing to displacement or imperfection of the septum. 5. Occasionally there is but one arterial trunk, which comes from a single ventricle, and then divides into two. 6. The ductus arteriosus is often pervious.

Some of the conditions just enumerated are met with together, being in fact the necessary consequences of each other. Thus the most common malformation observed is a combination of constriction of the pulmonary orifice with an open foramen ovale and a pervious ductus arteriosus, through which the blood passes from the aorta into the pulmonary artery, some of it also reaching the lungs through enlarged bronchial arteries. If the aorta is closed, the foramen ovale and ductus arteriosus also remain open, the blood being conveyed by the latter from the pulmonary artery into the aorta.

SYMPTOMS.—It will be noticed on studying the changes above mentioned, that they may disturb the circulation in one or more of three ways, viz. :—1. By allowing a free intermixture of venous and arterial blood. 2. By obstructing the circulation, especially interfering with its passage into the lungs, the venous system being hence overloaded; or with its return from these organs. 3. By rendering the systemic circulation entirely venous, the pulmonary entirely arterial, in consequence of transposition of the arteries. Some of the malformations are quite incompatible with life for any length of time. In other cases patients may live for many years, even up to twenty or more, and the symptoms may not declare themselves for a considerable time after birth. These symptoms are simply such as are associated with deficient blood-oxygenation and general venous stagnation, which have already been fully considered (Vol. ii., pages 2—3), and which are presented in some forms of malformation in their most intense degree. The colour of the surface may be blue, leaden, purple, livid, or of a claretty hue, often mottled, and it is very marked in the lips, ears, fingers, and toes. It is intensified by any act which tends to increase the difficulty in carrying on the circulation, such as crying or coughing. The cause of this discoloration has been much discussed, but it is probably the combined result of intermixture of venous and arterial blood; venous stasis; and imperfect arterialization. Fits of palpitation are common, being often attended with extreme irregularity, and a disposition to syncope or coma. Dyspnoea, cough, and other lung-symptoms are also of frequent occurrence, these organs being liable to various morbid changes.

The *physical signs* will vary according to the morbid condition present. If either of the orifices or valves is affected, there will be a

corresponding murmur, and a pulmonary murmur is most common in these cases. It is questionable whether a patent foramen ovale can give rise to a murmur. In course of time signs of hypertrophy and dilatation or of degeneration are very likely to be observed.

The *duration* of cases of congenital cyanosis is very variable, and patients sometimes linger on for a long while, apparently becoming accustomed to their semi-asphyxiated state. Death never takes place suddenly, but usually very gradually, being hastened, however, by pulmonary complaints, nervous disorders, and other causes.

TREATMENT.—All that can be done is to attend carefully to hygienic measures, including moderate exercise, baths followed by friction, and the wearing of warm clothing with flannel next the skin; to give plenty of good food, especially of a hydro-carbonaceous kind, including a small quantity of some alcoholic stimulant; and to treat any condition calling for special attention. Iron and other *tonics*, with cod liver oil, are often beneficial. A dry warm climate is desirable, and every source of cold must be avoided.

CHAPTER VIII.

DISEASES OF THE ARTERIES.

1. **Acute arteritis** is chiefly observed in connection with the aorta—*aortitis*—and probably this affection occurs in the course of blood-diseases more frequently than is generally recognized. It is characterized anatomically by injection of the vasa vasorum; thickening and softening of the coats of the artery; cloudiness and loss of polish of the inner surface, which also becomes rough from fibrinous deposit.

SYMPTOMS.—The symptoms which have been described in connection with aortitis are pain over the vessel, sometimes extreme, accompanied with much tenderness or superficial hyperæsthesia; a sense of heat and throbbing; severe constitutional disturbance and restlessness; sometimes a tendency to syncope; and dread of death. The *physical signs* are objective pulsation; and occasionally a thrill and murmur synchronous with the cardiac systole. In the smaller arteries inflammation may lead to complete plugging; but, on the other hand, a clot may be the exciting cause of inflammation.

2. **Chronic arteritis.**—**Atheroma.**—**Endarteritis deformans.**—Chronic arteritis is an important morbid process, and is now generally looked upon as originating the condition known as *atheroma*, this being preceded by a parenchymatous inflammation of the inner coat—*endarteritis deformans*.

ÆTIOLOGY.—The chief causes of chronic arteritis and consequent atheroma are:—1. *Local injury* from distension of, and strain upon, an artery, the disease being thus frequently induced by hypertrophy of the heart, overwork, &c. 2. *Constitutional affections*, namely, gout, rheumatism, syphilis. 3. *Abuse of alcohol*. 4. *Senile degeneration*.

ANATOMICAL CHARACTERS.—In the first instance the deeper layers

of the internal arterial coat become infiltrated with new cells, softened, relaxed, and thickened. The cells are probably mainly derived from proliferation. As the result of this process thickened patches or more extensive tracts are observed over the inner surface of the artery, and two kinds of patches are described, supposed by some to be merely stages of the same process, namely, those which are soft, jelly-like, moist, and pale-reddish; and firmer, semi-cartilaginous or horny, raised patches, translucent, but more opaque in the deeper layers, and compared in appearance to boiled white of egg (Niemeyer). The superficial portion of the coat is unaffected, and can be stripped off. More or less rapidly fatty degeneration sets in, this change beginning in the soft form chiefly in the superficial layers, in the cartilaginous variety in the deeper layers. In some cases degeneration takes place very speedily, owing to the abundance of cells, and a yellowish, soft, pul-taceous substance is formed, like a greasy paste, giving rise to a sort of pseudo-abscess or *atheromatous pustule*, which may ultimately burst into the artery; at first merely a small hole is formed in the inner coat, through which the soft contents escape, being then carried away by the blood, but finally an *atheromatous ulcer* is formed, varying in size and depth, sometimes extending down to or even involving the middle coat. The softened material consists of broken-down fibres, granular cells, abundant fat-granules, and crystals of cholesterin. In other cases, where the process is more chronic, the substance is firmer, becoming caseous; and in others more chronic still, partial organization takes place, leading to fibroid thickening, but this is always accompanied with some degree of degeneration. Ultimately calcification is very liable to happen; or, as some suppose, actual ossification, hard depressed plates being thus originated, or the smaller arteries being involved in their entire circumference, so that they are converted into rigid tubes. The calcareous plates are at first covered by the superficial portion of the lining membrane, but this is liable to give way, leaving a rough surface exposed, upon which fibrin is then very apt to be deposited.

The vessels affected, as well as the extent over which the changes are observed, vary widely, and different stages of the process are usually seen in the same case. The changes are most marked in those parts of the vessels which are subject to the greatest strain, especially in the ascending and transverse portions of the arch of the aorta, and around the openings of arteries which come off laterally, such as the intercostals. As a rule atheroma is more advanced in the aorta than in the arteries generally.

Special changes have been described in the arterial coats as the result of syphilis by Heubner, Davidson, and others, but more recent observations seem to contradict the view that such changes are confined to cases of syphilis.

As regards inflammation of the other coats of arteries, the *external coat* is sometimes involved by extension of inflammation from neighbouring structures, especially as a chronic process, and this leads to thickening and induration. The *middle coat* is occasionally specially involved, and a small abscess or pustule may form in it.

3. **Fatty Degeneration.**—Primary fatty degeneration of arteries is an entirely distinct process from that constituting atheroma. It begins

generally in the superficial part of the inner coat, but may extend into the middle coat, or may even implicate this originally. The epithelial and connective-tissue cells of the inner coat are directly changed, becoming more or less filled with fat-granules, but in the middle coat the muscular fibres undergo degeneration. This degeneration is usually characterized by small, scattered, irregular, opaque, yellowish-white patches, which are quite superficial, only very slightly projecting, and easily removed, leaving normal tissue underneath. As the deeper layers become involved, the patches appear more opaque and irregular, and are less easily stripped off. In course of time complete destruction and softening may take place, nothing but fat-granules remaining, which are carried away by the blood, leaving irregular superficial erosions. Finally calcification may be set up. The capillaries are also liable to become the seat of this fatty degeneration.

4. **Calcification.**—As already stated, calcification frequently follows other forms of degeneration, but it may also take place primarily in the coats of the arteries.

5. **Changes in Bright's Disease.**—In certain forms of Bright's disease of the kidneys the small arteries become contracted and thickened. According to one view the thickening is due to hypertrophy of the muscular coat; according to another it results from a hyalin-fibroid change (*see* BRIGHT'S DISEASE).

6. **Atrophy.**—Occasionally a large artery, especially the aorta, undergoes simple atrophy, the walls becoming gradually thinned.

7. **Alterations in Calibre.**—An artery may be the seat of *dilatation* in its entire circumference; or, on the other hand, of *contraction* or *coarctation*, which may end in its complete closure.

8. **Aneurism.**—This is one of the most important morbid conditions affecting arteries. Aneurisms, however, come more especially under the care of the surgeon, and therefore for a full and general consideration of the subject reference must be made to surgical treatises. In this work it will only be practicable to point out the main facts bearing upon thoracic and abdominal aneurisms, more particularly when the disease is connected with the aorta.

SYMPTOMS AND EFFECTS.—The consequences of the chief chronic changes just described are very similar, and they are of considerable importance, often giving rise to prominent symptoms connected with various organs, and leading to serious lesions of structure. Here it need only be indicated in a general way what these effects are, and they may be thus stated:—1. The elasticity of the arteries is more or less diminished, until finally it is completely lost; their resistance is increased; and they are ultimately converted into rigid tubes, at the same time their calibre being diminished. Hence an obstacle to the circulation arises, which leads to hypertrophy of the left ventricle, this, however, tending to be more or less speedily followed by cardiac degeneration. The circulation in the different organs is impeded, and among the most frequent symptoms resulting therefrom are those indicating disturbance of the cerebral circulation, especially giddiness and disorders of the special senses. Owing to the impairment of nutrition, structures are very liable to undergo degeneration, and to become inflamed from slight causes. 2. When the vessels are roughened on their inner sur-

face, fibrin is often deposited from the blood, which may ultimately cause their complete obstruction. As a consequence softening or death of a part may ensue, which is well exemplified by chronic softening of the brain, and by dry gangrene of the lower extremities. 3. A limited portion of an artery, especially after the formation of an atheromatous ulcer, is very prone to yield gradually, an aneurism being thus originated. 4. The affected vessels become brittle, particularly when calcified, and thus they are more easily ruptured, giving rise to cerebral apoplexy most commonly. 5. Fragments of the degenerate structures, or of fibrinous deposits may be detached, carried away by the blood-current, and lodged in some smaller vessels as emboli. 6. *Physical examination* of the arteries reveals that they are visible, tortuous, and locomotive; and that they feel more or less hard, full, incompressible, rigid or cord-like. A sphygmographic tracing is characterized by the large dimensions of its curves; the approximation of the secondary waves to the summit; and the great size of the first secondary wave as compared with the aortic, the latter being much diminished.

When the arch of the aorta is extensively diseased, especially calcified, a jerking impulse may be observed above the sternum, and occasionally a thrill; while a rough systolic murmur is sometimes heard along the course of the vessel, or a cardiac basic murmur may be intensified in this direction. The artery is often somewhat dilated at the same time, and this will increase the signs just mentioned.

DIAGNOSIS.—Degeneration of arteries should be always looked for in persons at all advanced in years, and it should be kept in mind as a probable cause of many symptoms of which they complain; the condition may, however, be met with in persons who are comparatively young. Examination of the vessels is the only satisfactory means of diagnosis, and if the arteries generally are affected, probably the aorta will be in the same condition. Some attach considerable importance to the sphygmographic tracing as revealing an early stage of degeneration.

PROGNOSIS.—This merely involves a knowledge of the dangers which accompany degeneration, so that they may be guarded against. Many persons live to a good old age whose vessels are much diseased, but at any moment there is a liability to dangerous lesions. The earlier the degeneration comes on, the more serious is the prognosis.

TREATMENT.—All that can be done is to avoid everything which is likely to throw a strain upon the vessels; and to maintain the nutritive activity of the system as much as possible by means of good diet, *tonics*, and cod-liver oil, the last being often decidedly useful. Any constitutional diathesis must be attended to; and all injurious habits checked.

THORACIC ANEURISM.

The aorta is by far the most common seat of aneurism within the chest, but the innominate, the commencement of the left carotid or subclavian, or the pulmonary artery may be involved.

ÆTIOLOGY.—Aneurism almost always results primarily from some

morbid change in the walls of an artery, especially from chronic endarteritis and the atheromatous changes connected therewith, but also sometimes from mere fatty degeneration or simple atrophy. Its *determining cause* is generally some more or less violent exertion, which throws a sudden or frequent strain upon the weak portion of the vessel, and this may even lead to rupture of part of its coats. It may be developed in this manner either suddenly, or more or less gradually.

Aneurism is much more common among males, especially those whose occupation entails violent efforts; and about the middle period of life. It is comparatively extremely frequent in the army, and this has been attributed to the combined effects of great exertion; tight clothing, which compresses the neck and chest, and obstructs the circulation; and heavy accoutrements. The diseases which predispose to changes in the vessels, such as syphilis, gout, and rheumatism, may be considered as *predisposing causes* of aneurism, especially syphilis. It has been stated to be occasionally hereditary, but this is probably only true as regards the degeneration of the vessels.

ANATOMICAL CHARACTERS.—The following varieties of aortic aneurism are met with:—1. There may be a *general dilatation*, involving the whole circumference, and either cylindrical, fusiform, or, very rarely, globular in shape. 2. *Sacculated aneurism* is the most important, in which there is a lateral bulging or sacculatum of a portion of the circumference, the coats being either entire—*simple* or *true aneurism*; or more or less of the inner and middle coats being destroyed—*compound* or *false aneurism*. Sometimes all the coats give way, and the aneurism is bounded only by surrounding structures—*diffuse aneurism*. 3. In extremely exceptional cases a *dissecting aneurism* is observed, the blood finding its way between the coats of the vessel. The ascending portion of the arch is most frequently affected, especially on its convex side, where the aorta is most exposed to strain; an aneurism may exist, however, on any part of this vessel, even between the pillars of the diaphragm. Great varieties are presented as to size, exact shape, contents, and other characters.

SYMPTOMS.—The symptoms of aortic aneurism are far from uniform; being chiefly due to pressure on surrounding structures (as described in Vol. ii., pages 4—5), and therefore influenced by its situation, size, form, rapidity of formation, and direction of growth; while they are also liable to alter during its progress. The symptoms are by no means in proportion to the external physical evidences of aneurism; indeed, the reverse is often true, because the more an aneurism tends in an inward direction, the more severe are the symptoms likely to be, and they may be extremely aggravated when it is impossible to detect any sign by physical examination. In some cases there are no symptoms or physical signs from first to last. Abnormal *local sensations* are usually present, such as pain, varying in characters and intensity, heat, fulness and weight, or throbbing; while tenderness is common. If the aneurism passes backwards, the pain may be deep and gnawing or grinding, owing to destruction of the vertebræ. Among the most frequent *pressure-symptoms* are those indicating interference with the

main air-tube, which in many cases first attract attention. The *constitution* often suffers markedly, even when there are no particular local symptoms or signs, and I have sometimes observed a very striking appearance of illness, combined with anæmia or a sallow cachectic look, and an anxious, distressed, or irritable expression, but without any particular emaciation, which has led me to suspect internal aneurism when there was no evident cause to account for these phenomena. The posture assumed by patients suffering from aortic aneurism depends upon its situation and other circumstances; as a rule they cannot lie down, but keep the head high, and some have a tendency towards a prone position, so as to take off pressure from the structures behind; bending the head forward and then throwing it back suddenly, is considered a movement suspicious of aneurism. The digestive organs frequently suffer. Head-symptoms are also common, with disturbed sleep. The urine is not altered. Aneurism may give rise to embolism in some distant organ, especially in the brain.

PHYSICAL SIGNS.—The following include the physical signs which are to be looked for as indicative of aneurism, but not uncommonly they are very obscure:—1. *Local bulging* may be detected, its site depending upon the part of the aorta involved. If the arch is affected in its ascending or transverse portion, the prominence will be in front, opposite or to the right or left of the upper part of the sternum, the exact situation differing much in different cases. Aneurism of the remainder of the arch, or of the descending aorta, may give rise to bulging posteriorly, generally to the left of the spine, occasionally to the right, and it is sometimes very extensive. In shape the swelling tends to be conical, and it involves the ribs and spaces equally. 2. *Pulsation* over any swelling, or even without any enlargement, is an important sign, this being usually synchronous with the ventricular systole, but sometimes double, or it may be more marked during the diastole. The systolic pulsation is usually expansile, and heaving or throbbing. Sometimes it is distinctly undulatory. In exceptional instances a thrill is felt. It is important to observe that the stethoscope may aid in discovering slight pulsation, when it cannot be detected by the fingers. 3. *Dulness* corresponding to any bulging may be elicited, though frequently extending beyond this to a variable degree and across the middle line, or being observed when there is no actual prominence; it is of a dull, dead, putty-like character; and is accompanied with increased resistance. 4. *Auscultation* gives extremely variable results. There may be nothing whatever heard, or only indefinite sounds. The important auscultatory sign of aneurism, however, is the presence of a rough *murmur*, usually systolic, occasionally double, or very exceptionally only diastolic. 5. There may be signs of hypertrophy of the left ventricle, but in most cases in which the heart is affected, this organ is merely displaced downwards and to the left. If the aneurism lies behind, the heart may be so pushed forward that the chief impulse is observed at the base. 6. Examination of the larynx and lungs might reveal functional disorder of, or organic mischief in the former; displacement of, and interference with the entrance of air into the latter; or bronchial catarrh on one or both sides. 7. The radial pulse often affords important signs, especially to the sphygmograph. The chief characters are that the pulse is delayed

on one side; or that it differs in fulness and force on the two sides. The sphygmograph reveals even a slight difference in the two pulses, but this is very marked in some cases. The dicrotism is often influenced also, and when the descending aorta is involved, this may be much increased, especially on the right side. An aneurism is capable of influencing the pulse, not only by its own direct effect upon the circulation, but also by obstructing the main arteries in consequence of pressure, closure of their orifices by a clot, or torsion.

MODES OF TERMINATION.—Death is the ordinary termination of aortic aneurism, and it may be immediately due to:—1. Gradual asthenia. 2. Effects of pressure. 3. Rupture and consequent hæmorrhage, which may take place into the pericardium, heart, neighbouring great vessels, pleura, mediastinum, trachea or either bronchus, lungs, œsophagus, spinal canal, or externally. 4. Independent affections, either acute or chronic.

DIAGNOSIS.—It would be easy to write to almost any extent on the difficulties which might and do arise in the diagnosis of thoracic aneurism, but it must here suffice to offer a few general observations on the subject. It is not only necessary to determine the presence of an aneurism, but also its seat, variety, size, and other characters as accurately as possible. In some cases the signs are so evident, that there is but little difficulty in making out all that is required; but the following classes of difficulties are principally met with, viz.:—1. There may only be symptoms indicating more or less pressure within the thorax; or sometimes merely obscure and ill-defined sensations, with constitutional disturbance, but no external signs. 2. An aneurism may give rise to the physical signs of a tumour, but without any pulsation or murmur. 3. Other pulsating prominences are occasionally observed besides aneurisms, the pulsation being usually transmitted from the heart or aorta.

The chief morbid conditions which aortic aneurism is liable to simulate, or *vice versâ*, are a solid mediastinal tumour or abscess, the latter occasionally presenting pulsation; pulsating empyæma; phthisical consolidation at the left apex, with subclavian or pulmonary murmur; swelling over the sternum from chronic periostitis or abscess; a tumour or suppuration in other parts of the chest-walls; pericardial effusion; innominate aneurism; cardiac disease. Among very rare conditions may be mentioned coarctation of the aorta; varicose aneurism; and aneurism of the pulmonary artery.

The points to be taken into account in making a diagnosis are as follows:—1. The age and sex of the patient; previous history, especially with regard to occupation and former diseases; family history; and that of the origin and progress of the complaint. 2. The presence or absence and exact characters of pressure-signs. 3. The other symptoms observed, particularly noting whether there is general dropsy or albuminuria. 4. The exact situation of any prominence. 5. The precise site, extent, rhythm, and characters of any pulsation, especially noting whether it is heaving and expansile, double, or attended with thrill; and if it is distinct from the cardiac pulsation. 6. The seat and extent of dulness, particularly observing whether it is in the course of the aorta, or crosses the middle line; and if it corresponds most to any pulsation

which may be evident. 7. The presence and characters of murmurs, but care must be taken not to mistake these for conducted cardiac murmurs. 8. The characters of the pulse, especially as revealed by the sphygmograph; and also the effects of pressure upon the great vessels in the neck.

The distinctions between aneurism and a *solid tumour* will be hereafter considered. The chief difficulties arising in the diagnosis of aneurism from *cardiac diseases* are, that aneurism may be simulated by enlargement of this organ accompanying valvular disease, especially if the aorta is atheromatous; or that an aneurism with very thin walls and fluid contents, pushing the heart downwards and to the left, may be mistaken for mere cardiac enlargement. The principal circumstances in favour of cardiac disease are there being but one centre of impulse; the physical signs corresponding to the region of the heart, or being most marked here; the absence of pressure-symptoms; and the presence of general dropsy or albuminuria.

As regards the *form* of an aneurism, the signs in favour of general fusiform dilatation are given by Walshe as more diffuse pulsation, both above and below the clavicle; well-marked thrill; rough, prolonged, rasping, whizzing, or whirring murmur, which is systolic, audible along the arch, or louder there than over the aortic orifice; and absence or slight degree of pressure-signs.

The *part of the vessel* affected must be determined by the locality of the physical signs, and the exact pressure-phenomena observed; comparison of the radial pulses, especially as revealed by the sphygmograph, may afford some aid.

In distinguishing *innominate aneurism* from *aortic*, the following considerations have weight:—The physical signs correspond in situation to the innominate artery; the prominence appears early, and it may displace the clavicle; it is said that dysphagia and dyspnoea from the pressure of an innominate aneurism are rare, but I have known both these symptoms extremely severe; there are often signs of pressure on the nerves of the right brachial plexus, and on the right bronchus; the right radial pulse is always modified; and pressure on the carotid and subclavian arteries on the same side diminishes the pulsation.

TREATMENT.—The first object in the treatment of an aneurism should be to endeavour to bring about its cure by promoting gradual coagulation within the sac, but this can only be aimed at in the sacculated variety of aortic aneurism. Failing this, it is necessary to protect the aneurism; to retard its developement as much as possible; and to treat the symptoms and complications which so frequently arise.

1. If it is intended in any case to attempt to cure a thoracic aneurism, it is absolutely essential to keep the patient *at rest in the recumbent posture* for a considerable time, and to avoid every source of physical or mental disturbance. Formerly it was the custom to have recourse to starvation and repeated venesection; but at the present day this has been with good reason modified into a *careful regulation of diet*, a definite quantity of solids and liquids being administered at stated intervals, according to Mr. Tufnell's method. The exact amounts allowed must depend upon each individual case, but everything should be strictly weighed or measured, the object being to support life with as little food

and drink as possible, without inducing nervous irritability. Excess of fluid must be particularly avoided, and all stimulants are to be prohibited. In some instances it may be advisable to remove a little blood from time to time, but it is very important to avoid inducing an anæmic condition.

The objects of this attention to rest and diet are to calm the circulation as much as possible, and to render the condition of the blood more favourable for coagulation, and undoubtedly some cases do improve considerably under this treatment alone. *Medicinal agents*, however, may be employed with benefit at the same time, viz., those which subdue and regulate the heart's action, such as digitalis, aconite; or belladonna; and those which promote coagulation, particularly gallic or tannic acid, tincture of steel, acetate of lead, and iodide of potassium. The use of iodide of potassium has been particularly advocated by Dr. William Roberts of Manchester, and Dr. George Balfour of Edinburgh, when given in large doses, even as much as from 15 to 30 grains thrice daily, and continued for a long period. I have found this drug of decided value in some cases. Subcutaneous injection of ergotine has also been recommended.

2. It must suffice merely to mention certain operative procedures which have been resorted to with the view of curing aortic aneurism. These are:—1. Injection of perchloride of iron into the sac. 2. Manipulation of the sac externally. 3. Galvano-puncture. 4. Introduction of a quantity of fine iron wire through a canula. 5. Ligation of the right carotid and subclavian arteries.

3. It would occupy too much space even to mention the various symptoms and complications which may require attention in the progress of a case of aneurism, and only a few practical points can be alluded to here. It is always well to keep the aneurism covered with cotton-wool, and should it be particularly prominent, some kind of protecting shield might be worn. For relieving pain and procuring sleep, the chief internal remedies are opium, morphia, hyoscyamus, lactucarium, hydrate of chloral, bromide of potassium, and conium in full doses. Subcutaneous injection of morphia is also most valuable. External applications are frequently useful, such as belladonna or opium plaster; belladonna or aconite liniment; cold poultices of linseed-meal and vinegar, conium, digitalis, or oak-bark (Walshe); ice, ether-spray, or chloroform cautiously applied; counter-irritation by flying blisters or iodine, which sometimes gives marked relief. Galvano-puncture may relieve pain considerably, as in a case thus treated by Dr. Bastian, which I had an opportunity of observing. If there are severe laryngeal symptoms, evidently due to pressure on the recurrent nerve, it is decidedly justifiable to perform tracheotomy and let the patient wear a tube in the trachea permanently. It has been suggested that in some cases the sterno-clavicular ligaments might be divided with advantage, in order to allow displacement of the clavicle forwards, and thus take off pressure from behind.

CHAPTER IX.

MEDIASTINAL TUMOURS.

AORTIC aneurism is the most frequent form of mediastinal enlargement, and therefore it has appeared to me most convenient to introduce in this place what has further to be said on the subject of mediastinal tumours. The other chief varieties met with include cancer (either encephaloid or scirrhus-encephaloid), originating in the œsophagus, lymphatic glands, root of the lung, or thymus gland; enlarged masses of absorbent glands in tuberculosis, or in Hodgkin's disease—lymphadenoma; fibro-cellular, fibrous, or fibro-fatty tumours; inflammatory exudation and abscess; very rarely masses of steatoma or hair.

SYMPTOMS.—The symptoms are mainly those indicative of pressure, and they accordingly present the usual variations. "Currant-jelly" expectoration is said to be common in cancer. There may be constitutional symptoms of this diathesis. The *physical signs* of a solid tumour are also widely different, but the following list will suggest those which are to be sought for:—1. *Local bulging*, especially in front, of variable extent, often irregular, not pulsating. 2. Deficiency or absence of *respiratory movements* over the seat of the growth, or in some instances over the whole of one side, from pressure on a bronchus. 3. Altered *percussion-sound*, often over a considerable area, it being either dull and toneless; hard, wooden, and high-pitched; or occasionally tubular or amphoric; there being also marked *resistance*. 4. *Respiratory-sounds* weak or absent, blowing, or tubular, according to the size of the growth, and its relation to the main air-tubes. 5. *Vocal fremitus* usually absent; and *vocal resonance* either deficient, bronchophonic, or pectoriloquous. 6. *Dry* and *moist râles* in the bronchi, either general, unilateral, or local, which are not infrequent. 7. *Displacement* of the heart and other structures; increased conduction of the heart-sounds; and occasionally a murmur, resulting from pressure on a great vessel.

DIAGNOSIS.—Mediastinal tumour has in the first place to be distinguished from other morbid conditions within the chest, especially chronic pneumonia; chronic pleuritic effusion; pericardial effusion; and enlargement of the heart. Careful consideration of the history of the case, as well as of its symptoms, physical signs, and progress, will rarely leave much doubt as to the diagnosis thus far. It is much more difficult, however, to determine the *nature* of any mediastinal enlargement. In the diagnosis between *aneurism* and a *solid tumour*, when this is at all doubtful, the following considerations have weight, which have been chiefly compiled from the observations of Dr. Walshe:—1. The facts of the patient being a female and under 25 years of age point to a solid tumour; the family history may be suggestive of cancer; or the occupation may be in favour of aneurism. 2. As regards *symptoms*, dysphagia and severe pain, especially posteriorly, are more common in aneurism; œdema of the arm and chest,

frequent hæmoptysis, and currant-jelly expectoration, are more characteristic of tumour. Occasionally cancer-elements may be discharged in the sputa. 3. The *physical signs* are of much value. The limitation of such signs to the region of the aorta; the presence of any thrill; a double impulse, especially with doubling of the diastolic share; and gradual approach of any pulsation to the surface, are suggestive of aneurism. Great superficial extent of dulness; absence of any heaving character in the pulsation, should this sign be present; and the want of accordance between it and the maximum dulness, are in favour of a solid tumour. 4. Careful examination may reveal cancer in other parts; or there may be constitutional indications of its presence.

With regard to the distinction between *different solid enlargements*, all that can be stated is that cancer is the most common; there may be signs of the cancerous cachexia or of cancer in other parts; while abundant hæmoptysis is by far most frequent in this form of tumour, or cancer-cells may be expectorated. It also grows outwards, and has a rapid progress. Lymphadenomatous growths must, however, be borne in mind, as they are likely to be mistaken for cancer.

TREATMENT.—All that can be done is to relieve symptoms as they arise.

CHAPTER X.

ON CERTAIN ABNORMAL CONDITIONS OF THE BLOOD.

THE blood is liable to numerous deviations from its healthy state, but of these alterations, though they are interesting and important, the limits of this work will only permit a general outline to be given, with two exceptions. The changes observed may be arranged as follows:—

- I. In the absolute quantity of the blood. This may be:—
 1. Excessive (*plethora* or *hyperæmia*).
 2. Deficient (*hypæmia* or *anæmia*).
- II. In obvious physical characters. The blood may be unusually pale and watery; dark from pigment; thick and tarry; or the serum has sometimes a milky appearance, due to the presence of fat.
- III. In the number and characters of the corpuscles.
 1. The red corpuscles may be:—(a) deficient (*oligocythæmia*); (b) in excess (*polycythæmia*); (c) deficient in hæmoglobin; or (d) altered in shape and size, or in their tendency to and mode of mutual adhesion.
 2. The white corpuscles are often too numerous, but this is particularly seen in the condition named *leucocythæmia*, which will be considered under splenic diseases.
- IV. In the normal chemical constituents.
 1. Fibrin may be:—(a) increased (*hyperinosis*); (b) diminished (*hypinosis*); or (c) altered in its tendency to coagulate.
 2. Albumen is frequently deficient; sometimes above the normal.
 3. Water may be excessive (*hydræmia*); or deficient.
 4. A diminution in alkaline or earthy salts, especially those of potash and lime, is considered important in some diseases; occasionally they are increased.
 5. Fatty

elements, particularly cholesterin, may be present in unusual quantity. V. **Abnormal chemical substances** are often found in the blood; or at all events such as are usually present in so small a quantity as to be detected only with difficulty, and to be practically harmless, *e.g.*, lactic, uric, formic, and other organic acids; leucine and tyrosine; urea and its products; bile-elements; and certain metals. VI. **Abnormal microscopic particles** are also not uncommonly observed, such as abundant pigment-granules (*melanæmia*); pus corpuscles; animal or vegetable parasites.

In numerous instances more than one of the deviations just alluded to is observed.

ANÆMIA—SPANÆMIA—CHLOROSIS.

The term *anæmia* is used very vaguely, and, in addition to its strictly literal sense, it is applied in practice to three classes of cases, *viz.* :—(a) where the blood as a whole is deficient in quantity; (b) where it presents certain abnormal qualities; and (c) where the arteries are inadequately filled. These conditions, however, are usually more or less combined. The chief alterations in quality include deficiency of red corpuscles, or of hæmoglobin in these corpuscles; often deficiency of albumen; with excess of water and salts, the serum having a low specific gravity. Fibrinogenous elements are proportionately high, and the blood has a tendency to coagulate in the veins. The deficiency of red corpuscles may be due to direct loss of blood; imperfect formation; or excessive destruction. In one form of anæmia they are more numerous, but ill-shaped, and there is much granular matter in the blood. *Chlorosis* or *green sickness* merely signifies that there is a peculiar greenish or yellowish-green tint, such as is frequently observed in anæmic girls, associated with menstrual derangements, the colour being supposed to depend upon some chemical change in the blood-pigments.

ÆTIOLOGY.—Very many causes may give rise to anæmia, but the chief include considerable loss of blood at one time, or repeated small losses; unfavourable hygienic conditions, especially constant sedentary or laborious employment in a confined atmosphere, with deficiency of sunlight; improper or insufficient food, particularly a want of animal diet; impaired power of digestion; excessive drain upon the system, such as from over-lactation, diarrhoea, or chronic suppuration; prolonged exposure to malarial influence, with or without attacks of ague; various chronic diseases which interfere with nutrition, *e.g.*, phthisis, cancer, renal disease, leucocythæmia, gastric ulcer; acute febrile diseases; excessive venery or masturbation; depressing mental influences; chronic poisoning by lead, mercury, and other metals. In many instances several of these causes have combined in inducing anæmia. An anæmic aspect may be a striking feature in persons suffering from disease at the mitral or aortic orifice, or of the aorta itself, such as coarctation or aneurism, this appearance being mainly the result of an insufficient supply of blood to the arteries.

Females, especially those from 15 to 25 years of age, are most frequently the subjects of anæmia or chlorosis. This has been supposed

to be mainly the result of the great demands made upon the developmental powers about the period of puberty, but commonly it will be found in the history of these cases that there are some other obvious causes, which at all events have aided materially in giving rise to the anæmic condition, the most important being long-continued habitual constipation, which necessarily leads to derangement of the digestive organs and consequent imperfect nutrition; and abstinence from animal food, this being the consequence of the loss*of appetite, or rather disgust for food, which is necessarily associated with the unhealthy state of the alimentary canal. Some authorities lay much stress upon uterine displacement as a cause of chlorosis. Other influences are also frequently at work in these cases, such as deficient exercise; close confinement; over-work, particularly with certain sewing-machines; and mental depression. Virchow has affirmed that in chlorotic subjects the aorta and its branches are frequently congenitally small and attenuated; and that irregularities in the origin of the arteries are common. To this condition he attributes a causative relation in such cases.

A form of *idiopathic* anæmia is described; and of late special attention has been directed to a variety named *pernicious* or *malignant* anæmia, which also cannot be traced to any known causes.

SYMPTOMS.—The appearance of persons suffering from anæmia is, as a rule, sufficiently characteristic. They are pale, often waxy-looking, and have usually a clear transparent skin; or, as already mentioned, a greenish or yellowish-green hue is observed in chlorotic girls. The veins are frequently, however, very evident, and may have a peculiar pinkish tint. The mucous membranes present the most marked signs of anæmia, especially the conjunctiva of the lower eyelid, and the membrane covering the lips, gums, and tongue, these being more or less pale and bloodless. The nails also show the anæmic appearance well. The sclerotics appear clear and bluish or white. The general condition will vary according to the cause of the anæmia; in chlorosis the patient is often apparently well-nourished, though the tissues are usually flabby and wanting in tone. (Edema about the ankles, and puffiness of the eyelids in the morning, are common symptoms, and there may even be considerable anasarca of the legs after standing for some time. The influence of anæmia in promoting dropsy from other causes has been previously alluded to, and is often considerable.

The subjective sensations complained of are also of a very uniform character in chlorotic girls. These are debility, languor, and incapacity for exertion; general chilliness and coldness of the extremities; shortness of breath and palpitation after any effort, especially after ascending a height or going upstairs, or even when at rest; a tendency to syncope from time to time; headache, dizziness, and noises in the ears; neuralgic and hysterical pains in different parts of the body, but especially in the left side, this being frequently accompanied with tenderness, and being liable to come and go. It has appeared to me that this pain in the left side may possibly be connected with the spleen in some cases. Anæmic females are often low-spirited or irritable, and subject to hysterical attacks.

The digestive organs are usually at fault in cases of chlorosis. Appe-

tite is impaired or depraved, and there may be an absolute disgust for food, especially for meat. Gastralgia and atonic dyspepsia are common complaints. The bowels are obstinately constipated as a rule. Hæmatemesis and melæna occur in some cases. Menstruation is almost always deranged, being absent, infrequent, irregular, scanty, unhealthy, painful, or sometimes menorrhagic. Leucorrhœa is also a frequent symptom.

Certain abnormal *physical signs* are observed in marked anæmia, which have been already described, and therefore need only be enumerated here, viz., a *systolic murmur* at the base of the heart, usually pulmonary, and occasionally at the left apex; a *blowing murmur* in the arteries, especially the subclavian, and sometimes a *thrill*; and a *venous hum*, which is in some cases even heard over the cranium, and may also be accompanied with a *thrill*. The heart's action is very liable to be disturbed, becoming easily excited and hurried, and in severe cases even irregular. The pulse is small, feeble, and compressible; or sometimes scarcely perceptible.

The urine frequently presents important changes, being pale and watery, excessive in quantity, of low specific gravity, deficient in acidity, with a marked decrease in the amount of pigment.

It has been asserted that anæmia may ultimately lead to organic diseases, such as phthisis or gastric ulcer. Acute affections occurring in anæmic individuals are apt to assume a low type, and to be followed by protracted convalescence.

Pernicious or *progressive anæmia* is chiefly observed in middle-aged, pregnant females. There are signs of excessive anæmia; while gastric disorder, and general hæmorrhages are frequent. The blood contains numerous ill-shaped red corpuscles, and much granular matter. In some cases irregular febrile attacks are observed. The course is steadily progressive, and the termination generally fatal.

TREATMENT.—The first thing to be done in all cases of anæmia is to find out its causes, and remove these if possible. Attention to *hygienic conditions* is most essential, especially in the case of chlorotic girls. Fresh air, good light, out-door exercise, avoidance of late hours and of hot and crowded rooms, change of air and scene to some dry and bracing climate, especially to the sea-side, cheerful society, and the removal of all disturbing mental influences, are most efficient aids in treatment. Baths, particularly sea-bathing, or douches followed by friction, are very beneficial if followed by good reaction.

In the next place it is most important to look to the *diet*, and to the state of the *digestive organs*. Nutritious food must be given at stated intervals, and it is often requisite to lay down strict rules on this matter, particularly with regard to meat, to which many of these patients have a strong objection. It ought to be taken underdone, and if it causes pain it may be pounded. Nutritious soups are also useful, and beer or wine is generally indicated. The state of the bowels demands particular notice, and the patient should be fully impressed with the necessity of having a sufficient daily evacuation. Aloes is one of the best forms of aperient in these cases, given at night in the form of pil: aloes & myrrh; or as watery extract with extract of belladonna and nuxvomica. Remedies which act upon the stomach are frequently very

beneficial also ; carbonate of bismuth with hydrocyanic acid being particularly valuable for relieving the unpleasant and painful sensations connected with this organ, when taken shortly before meals.

Iron in some form is the great *medicinal remedy* in anæmia. The *mistura: ferri: co:* is eminently efficacious in chlorosis, and among other excellent preparations may be mentioned *pilula: ferri: co:*, the saccharated carbonate, the ammonio-citrate, and the *ferrum redactum*. Tincture of steel is invaluable in many cases, especially when the anæmia is associated with excessive discharges. The solution of the perchloride or pernitrate, the sulphate, and the magnetic oxide are also very useful preparations ; while in anæmic children steel-wine and tartrate of iron produce excellent results. Of late dialyzed iron has come much into use. Chalybeate waters are beneficial in some instances. Iron may be combined with infusion of quassia or calumba, or with quinine or strychnine when required, and some practitioners recommend it to be given along with arsenic, manganese, pepsine, and other remedies. The citrate of quinine and iron, and Easton's syrup are very valuable preparations. It is frequently desirable to change the form of the preparation from time to time ; or even to stop the administration of iron temporarily, should it appear to disagree.

The pain in the side often requires attention in chlorosis, and is usually much relieved by making the patient wear a belladonna plaster. Other symptoms must be treated as they arise.

In *idiopathic*, and still more, in *pernicious* anæmia, remedies have little or no effect. Transfusion has been performed in many instances, but without success. This might also be required for anæmia from great loss of blood.

PYÆMIA—SEPTICÆMIA.

This subject belongs principally to surgery, and in this work it is merely intended to indicate the chief practical facts with regard to cases of pyæmia or septicæmia, which come under notice occasionally in medical practice.

ÆTIOLOGY.—Excluding obvious injuries and operations, the exciting causes of pyæmia or septicæmia may be arranged as follows:—1. Disease of bones, either acute or chronic, leading to suppuration ; it may thus arise from disease of the temporal bone. 2. Affections of the heart or vessels originating septic materials which contaminate the blood, *e.g.*, endocarditis ; softening of clots, especially in the veins ; phlebitis. 3. Formation of abscesses or gangrene in any part, either external to or within organs. 4. Ulceration of mucous surfaces, *e.g.*, the gall-bladder or its duct, or the intestines. 5. Inflammation of a low type and attended with suppuration, implicating the pelvis of the kidney, the bladder, or the urinary passages. 6. Diseases characterized by external inflammation of an unhealthy character, leading to the formation of pus, especially certain varieties of erysipelas, variola, vaccinia in connection with re-vaccination, malignant pustule, glanders, carbuncles or boils ; under this class may also be mentioned dissection and post-mortem wounds. 7. Low fevers occasionally, such as typhus, there being no evident local source of blood-poisoning. 8. Idiopathic pyæmia has been described,

but it must be borne in mind that pyæmia may follow a very slight injury in unhealthy subjects, and that there are many internal causes which might escape detection.

There is much controversy with regard to the immediate pathological cause of pyæmia and septicæmia. No doubt some infective poisonous material enters the blood, but the nature of this agent is still much disputed, the chief views being that it is merely a chemical fluid; that it consists of pus-elements; or that it is of the nature of living organisms, such as bacteria. Most probably there is no essential difference between pyæmia and septicæmia.

ANATOMICAL CHARACTERS.—It is highly probable that pyæmia may cause death without originating any characteristic post-mortem appearances. The morbid changes which it tends to produce may be summed up thus :—1. Intense congestion throughout the various organs and tissues of the body. 2. Hæmorrhages, in the form of petechiæ or vibices in connection with the skin, mucous, and serous membranes; hæmorrhage into serous cavities; extravasations into muscles and among deep tissues; and apoplectic clots in the substance of organs, which are prone to undergo rapid destructive changes. 3. Acute inflammation in the solid organs, of a low type. 4. Formation of abscesses in these organs, often in considerable numbers, of good size and containing unhealthy pus; resulting either from hæmorrhagic clots, inflammation, or sloughing. 5. Gangrene of portions of organs. 6. Low serous inflammations, with a tendency to purulent effusion, which may be confined within adhesions; and to the production of unhealthy lymph. 7. Inflammation of mucous surfaces, leading to suppuration, ulceration, or sometimes to submucous abscesses or gangrene. 8. Severe inflammation of joints, with a great tendency to rapid formation of pus, and to destruction and disorganization of tissues, both within and around the joints, several of them being usually involved. 9. Inflammation and formation of abscesses in various parts of the body, namely in the substance of muscles; in the cellular tissue, either superficial or deep; or sometimes in the skin itself, giving rise to pustules.

SYMPTOMS.—In many instances pyæmia reveals itself very insidiously, but its characteristic symptoms in an acute case are mainly these :—Rigors set in suddenly, being severe and prolonged in character, and repeated at irregular intervals. The temperature often rises rapidly to a high point, being usually very elevated throughout, but subject to marked and extremely irregular changes. Profuse sweating follows the rigors, in the intervals the skin being hot, dry, and harsh. There is a marked expression of illness, and a tendency to early prostration, combined with restlessness or heaviness. The skin soon assumes a sallow and yellowish aspect, and frequently considerable jaundice becomes evident; signs of congestion and petechiæ may often be seen, and sometimes sudamina, or a vesicular or pustular eruption. The digestive organs are usually much disturbed from the outset, there being anorexia, great thirst, nausea and vomiting, frequently with a glazed or furred and irritable tongue, and in some cases foetid diarrhœa. The pulse is frequent, feeble, and liable to rapid variations. Respiration is also hurried, and the breath has a peculiar sweetish odour in some cases. Albuminuria is not uncommon.

In a short time the symptoms and signs of the *local lesions* usually appear in various parts, these necessarily differing according to the structures which are affected. The joints are involved with considerable frequency, becoming very painful and swollen. The further tendency is towards rapid and extreme prostration and adynamia, with low nervous symptoms; the face becoming pale and pinched; the heart's action exceedingly rapid, weak, irregular, and intermittent, as evidenced by the impulse, sounds, and pulse; the tongue brown and dry, with sordes on the teeth and gums; delirium, coma, or, rarely, convulsions setting in at last, with involuntary discharge of fæces and urine.

In some instances pyæmia is evidenced chiefly by its general symptoms; in others it runs a somewhat chronic course, and may then terminate in recovery. Some authorities regard certain diseases, which will hereafter be considered, as originating in a local pyæmia.

DIAGNOSIS.—It is important to distinguish pyæmia from various fevers and acute inflammatory affections which the disease may simulate; and to bear in mind its possible occurrence in connection with the morbid conditions mentioned under its ætiology. In some cases its course of temperature causes the complaint to resemble, and to be mistaken for ague.

TREATMENT.—The only chance of recovery lies in the free and regular administration of nutritious food, *stimulants*, and *tonics*, especially mineral acids, bark, quinine, and tincture of steel. *Antiseptics* have also been strongly recommended, and may be given along with the remedies just indicated. Local lesions must be attended to as they arise.

CHAPTER XI.

THROMBOSIS AND EMBOLISM.

By *thrombosis* is meant a local coagulation of blood during life, either within the heart or a vessel, a clot being thus formed, named a *thrombus*.

Embolism signifies the partial or entire plugging of a blood-vessel by a solid fragment or *embolus* conveyed from some distant part.

I. THROMBOSIS.

ÆTIOLOGY.—The causes which tend to the formation of a thrombus may be thus stated:—1. Anything which impedes or retards the *blood-current*, e.g., valvular and other organic diseases of the heart, pressure upon its cavities, or mere feeble cardiac action, such as is observed after fevers, or in various chronic wasting affections; affections of the lungs impeding the pulmonary circulation; obstruction of a vessel as the result of constriction, pressure, or internal plugging, especially by an embolus; pressure upon the capillaries of a part; solution of continuity of a vessel; and dilatation of vessels, particularly in connection

with aneurisms, varicose veins, and distended venous plexuses. A generally feeble state of the circulation, and gravitation of the blood into dependent parts, may also contribute to the formation of a thrombus. 2. Conditions which give rise to an abnormal condition of the *inner surface of the heart*, or of the *coats of the vessels*, e.g., acute inflammation; fissuring of the surface; atheroma or calcification; projection of cancerous and other new formations into the interior of vessels; and the changes in their walls associated with surrounding gangrene or inflammation. 3. Certain conditions of *the blood*, namely, hyperinosis or increased tendency in the fibrin to coagulate, such as may be observed in various acute inflammatory affections, and in pregnancy; probably pyæmia and allied states; and anæmia. Increased heat of the blood, either local or general, has been looked upon by Richardson and others as a probable cause of thrombosis. In many instances more than one of the above-mentioned conditions has contributed to the clotting process.

In further considering this subject it will be convenient to treat separately thrombosis of the *heart*, *pulmonary artery*, and *systemic vessels*.

A. Cardiac Thrombosis.—Intra-cardiac Blood-concretions.—Coagula may form in the heart after death; immediately before this event; or at some previous period more or less remote. These are distinguished from each other by their colour; consistence; mode of arrangement with regard to, and degree of adhesion with the cardiac walls; whether they are laminated or not; and whether they have undergone changes, either in the direction of organization or softening. It is desirable to make a few special remarks respecting the coagulation occurring shortly before death, as this is probably often a very dangerous event, and one which aids materially in bringing about a fatal result. It is observed in connection with organic diseases of the heart which obstruct the circulation, or which roughen the endocardial surface, but is most important in certain acute diseases, being then due to a condition of the blood favourable to coagulation, combined with a gradual loss of power in the cardiac contractions, in consequence of which the blood is not properly expelled out of the cavities of the heart, but is partially whipped up and its fibrin deposited. Obstruction in the lungs frequently contributes to the clotting process. Among the most important diseases in which this has been observed are croup, diphtheria, endocarditis, pneumonia, peritonitis, the puerperal condition, erysipelas, rheumatic fever, and pyæmia and its allies. Cardiac thrombosis is much more common, as well as more dangerous, in the right cavities than the left, but may occur on both sides of the heart. Usually the clots are decolorized, pale or yellowish, but not uniform throughout; firm and fibrinous; often laminated and fibrillated or granular; entangled among the muscular bands and tendinous cords; somewhat adherent to the surface, but separable without injuring the endocardium. Occasionally they soften in the centre. They may extend for a variable distance into the pulmonary artery or aorta, these portions frequently presenting marks of the valves, but they can be readily removed.

SYMPTOMS AND SIGNS.—The effects of cardiac thrombosis will vary with the rapidity of its production, its seat, and its extent. The dangers arising from this condition are that it causes obstruction to the circula-

tion, and interference with the heart's action; that large portions may become detached, and lodged either in one of the main orifices or in an arterial trunk; or that smaller particles should be separated, and conveyed to the smaller vessels as emboli. Probably also the products of the softening of a clot may poison the blood generally. Sudden extensive clotting is characterized by great disturbance of the cardiac action, which becomes irregular and very hurried, the pulse being extremely weak and small; a tendency to syncope; urgent dyspnœa; intense restlessness and anxiety; followed by signs of obstruction, either in the pulmonary or venous circulation or both, according to the situation of the clot. In less rapid cases the obstructive symptoms are chiefly observed, combined with more or less cardiac distress. Plugging of a cardiac orifice or great vessel by a clot may cause instantaneous death. The *physical signs* are tumultuous action of the heart, or great irregularity in the rhythm and force of the impulse; increased cardiac dulness, especially towards the right; obscurity and irregularity of the sounds, particularly the first; and alteration in murmurs, or the production of a new murmur, especially a pulmonary systolic bruit.

TREATMENT.—The measures required in this condition are absolute rest in the recumbent posture; the administration of *stimulants*, especially if there is a syncopal tendency, with as much liquid nourishment as the patient can take comfortably; the application of heat to the extremities; and free dry-cupping over the chest. Formerly alkaline bicarbonates were recommended to be freely given, along with carbonate of ammonia. Dr. Richardson has advocated the use of liquor ammoniæ (℥ x in iced water every hour) with iodide of potassium (gr. iii to gr. v every alternate hour), which he has found highly successful. In some instances digitalis might, perhaps, be of use, in order to excite stronger contraction of the heart; or gentle galvanism might be tried. All lowering measures are injurious; and opiates must be avoided.

B. Thrombosis in the Pulmonary Artery and its Branches.—Much discussion has been carried on relative to pulmonary thrombosis, especially as it occurs in women after parturition. Occasionally such persons die suddenly, and after death extensive clots are found in the pulmonary artery and its divisions, which some authorities believe to have been the cause of death, and to have formed there primarily and independently; others think that they are the result of embolism, fragments having become detached from clots in the veins or heart, and lodged in the pulmonary vessels as centres for coagulation; while still others regard death as being due to syncope, and the clot to be merely of post-mortem formation. The probability is that in most instances at all events embolism has something to do with the phenomena observed; and it is quite possible that a large mass may be sometimes carried into the pulmonary artery, so as to obstruct this vessel more or less completely.

Clots may be found only in the main pulmonary trunk and its larger divisions; in the smaller branches; or more or less throughout. According to the extent involved, and to the rapidity of coagulation, will the clinical phenomena vary. In some instances, as already stated,

sudden death is believed to occur, preceded by a cry, this event following some effort after parturition. When only the smaller branches are affected there are no symptoms. If the clotting is more extensive, the symptoms are more or less dyspnoea and sense of want of air, with a feeling of oppression across the chest; evidences of cardiac embarrassment; faintness or actual syncope; much general distress and anxiety; followed by signs of overloading of the right heart, and general venous congestion. These symptoms may temporarily subside, and then recur. It is highly probable that coagulation in the pulmonary vessels often adds to the danger of various diseases of the lungs and general diseases, and that it prolongs the duration of the former.

TREATMENT must be similar to that for cardiac thrombosis.

C. Thrombosis in the Systemic Veins.—Phlegmasia Dolens.

—The formation of clots in the systemic veins is by no means an uncommon occurrence, resulting from pressure, obstruction, feeble circulation, altered blood, and other causes; but it is most important in connection with the affection named *phlegmasia dolens*, in which as a rule the lower extremity is involved, the external iliac or femoral vein becoming obstructed on one or both sides, or sometimes the common iliac; occasionally the arm is affected. The formation of clots in the venous sinuses of the dura mater is also a very serious matter, which I have observed as the result of injury or disease of the cranial bones.

Phlegmasia dolens is most frequently associated with the puerperal state, coming on at a variable period after delivery, but it may also occur as a sequela of acute febrile diseases, especially typhus or typhoid fever, pleurisy, and pneumonia; and in the advanced stages of various chronic diseases, particularly phthisis, and malignant uterine disease. Different views are held as to the pathology of this affection. Some regard inflammation of the veins—*phlebitis*—as the primary lesion after parturition, this having extended from the uterine veins; others consider that the plugging is the first event, thrombosis resulting from impure blood or embolism, the emboli frequently coming from thrombi in the pulmonary vessels, and that the inflammation is secondary. Certainly in the cases which have fallen under my observation, where *phlegmasia* has arisen independently of parturition, coagulation has appeared to be the primary morbid condition, and it has sometimes been brought about by an effort, especially when this was accompanied with temporary obstruction of the venous circulation in some part.

ANATOMICAL CHARACTERS.—A thrombus in a vein varies in its characters, according to its age and mode of formation. If a vessel is suddenly plugged, the clot is at first uniform throughout, soft, and red; but if this is gradually formed, it presents a stratified appearance, and the strata may consist of alternate layers of fibrin and white corpuscles. The thrombus increases in extent after its first formation, the degree of extension depending chiefly on the force of the circulation, and on the size and situation of the collateral branches. The thrombus undergoes the usual changes in colour and consistence; becomes adherent to the vessel, in which it frequently excites inflammation; and organization often follows, so that ultimately a fibrous cord alone remains, the vein

being obliterated—*adhesive phlebitis*. Occasionally calcification takes place, a “phlebolith” being produced. In some instances the clot undergoes partial or complete softening or liquefaction, beginning in the centre, and a puriform fluid may result, consisting either of granules and molecules derived from the fibrin, with broken-down corpuscles; or, as some believe, of actual pus, derived from proliferation of white corpuscles. This is probably the pathology of so-called *suppurative phlebitis*. In this way the clot may be completely removed; or substances are originated which contaminate and poison the blood.

In *phlegmasia dolens* the smaller veins and lymphatics also become speedily involved, and more or less inflammation is in many cases set up in the skin and subcutaneous tissue, or even in the deeper structures.

SYMPTOMS AND EFFECTS.—The symptoms which may be associated with venous thrombosis are those due to:—1. Local irritation by the clot. 2. Obstruction of the vein, and consequent interference with the circulation. 3. Detachment of embolic fragments. 4. Constitutional disturbance, which may result from the formation of septic matters and contamination of the blood. In *phlegmasia dolens* pain and tenderness along the veins and lymphatics of the thigh are usually complained of to a variable degree. One case which came under my notice, in which the disease followed typhus fever, commenced with a sudden intense pain at the moment of coagulation, which afterwards became most excruciating, being deeply situated in the course of the femoral vein, and of an aching or somewhat neuralgic character. In phthisis, also, phlegmasia is often the cause of much distress. The veins are in time felt to be thickened and firm, or cord-like, and the lymphatics are visible as superficial red lines. Soon there may be signs of venous congestion, but very speedily this is followed by a deadly whiteness of the limb—*white leg*—which swells from below upwards, chiefly on account of œdema, sometimes attaining an enormous size, and becoming tense or elastic, with a most uncomfortable subjective feeling of tightness. In course of time the superficial veins become enlarged and varicose if the obstruction is not removed, and the leg often remains swollen for many months or even permanently, the tissues being thickened and indurated. Rigors may be experienced at the outset, followed by pyrexia and much prostration.

TREATMENT.—In *phlegmasia dolens* the most efficient treatment is to support the patient by nourishing food and *stimulants*; to keep the leg perfectly at rest in a horizontal posture, or even a little raised; to use hot opiate or belladonna fomentations assiduously; and to give *sedatives* for the purpose of relieving pain, if required. Subsequently *tonics*, especially iron and quinine; good diet; and change of air are most beneficial; with douching, frictions, and shampooing of the limb, this being either carefully bandaged, or an elastic stocking being worn. Great improvement may be effected, even after a long interval.

D. Thrombosis in the Arteries.—This is almost always associated either with a diseased condition of the walls of a vessel; or with embolism. Its symptoms are merely those indicative of local obstruction of the artery involved.

II. EMBOLISM.

ORIGIN OF, AND ANATOMICAL CHANGES RESULTING FROM EMBOLI.

—The following are the principal sources of emboli:—1. Most commonly a thrombus, either in a systemic vein; in the heart; in an artery, especially in connection with aneurism; or, rarely, in the pulmonary vessels. 2. Vegetations about the valves and orifices of the heart, particularly if associated with obstructive disease, especially mitral stenosis. 3. Atheroma and calcification of the cardiac valves or of arteries, portions of the morbid materials becoming detached. 4. New growths, such as cancer, communicating with the interior of vessels. 5. Particles resulting from gangrene of organs. 6. Parasites which have gained access into the vessels. 7. Pigment granules. 8. Fat particles from bone-marrow.

According to the size and place of origin of the embolus, will the seat of its arrest vary. It may be sufficiently large to plug an artery of considerable size, or is only stopped in the capillaries. When originating in the venous portion of the circulation, emboli rarely pass beyond the pulmonary capillaries, but become impacted in them as a rule; those coming from the pulmonary vessels, the left side of the heart, or the arteries, lodge either in smaller arteries or in the capillaries, and especially in the vessels of the brain, spleen, and kidneys; those from the portal tributaries are generally arrested in the capillaries of the liver. An embolus is chiefly carried in the direction of the main stream, and it is somewhat influenced by gravitation. The seat of impaction is often at a bifurcation, and the closure may be complete or only partial at first, but a secondary thrombus always forms, so that ultimately the vessel is entirely blocked up to a variable extent. Secondary emboli are sometimes separated from the primary one or the resulting thrombus, and pass on into smaller vessels. Embolism causes local irritation in the vessel in which the embolus lodges, and is soon followed by marked hyperæmia in the collateral vessels around, extending over a variable area, which often terminates in their rupture, with the formation of a so-called *hæmorrhagic infarct*. In time the latter either becomes decolorized, more consistent, and organized; or a process of softening and molecular disintegration takes place, beginning in the centre of the infarct, and extending more or less to the circumference, the *débris* of the involved tissue being evident in the softened mass. Ultimately it may be absorbed; or remain as a caseous encapsuled mass; or become calcified. The nature of the changes will depend upon the degree to which the circulation is obstructed, and the difficulty or impossibility of establishing the collateral circulation; the tissue affected; the size of the infarct; and the nature of the embolus. If this has septic properties, as is the case when it comes from a gangrenous part, it sets up rapid and violent inflammation, ending in speedy disorganization, with the production of a puriform material, constituting an *embolic abscess*, which is surrounded by hyperæmia.

The effects of an embolus, as regards the part supplied by the vessel which is blocked up, are similar to those of obstruction from

any other cause, namely, anæmia, atrophy, softening, fatty degeneration, or actual gangrene.

The most important seats of embolism are the vessels of the lungs, brain, spleen, kidneys, and heart. Petechial spots on the skin, or on mucous and serous membranes, are sometimes due to this cause. A very interesting case came under my notice in which sudden embolism occurred in connection with the main vessels of the fore-arm.

SYMPTOMS.—The clinical phenomena of embolism necessarily vary greatly according to the vessels affected; the rapidity and degree of obstruction; the characters of the embolus; and other circumstances. It need only be stated here in a general way that the early symptoms, if any, are those significant of sudden or gradual obstruction of the vessels supplying some organ or part; followed by those indicating the local effects of the embolus, and in some cases by evidences of septicæmia. Embolism affecting particular organs is considered in the chapters devoted to the discussion of their several diseases.

TREATMENT.—There is no special treatment applicable to embolism. Attention must be directed to the organ involved, the ill-effects resulting from the morbid process being obviated by rest, and by the adoption of any other measures which may be indicated in each particular case.

CHAPTER XII.

DISEASES OF THE ABDOMEN.

PHYSICAL EXAMINATION OF THE ABDOMEN.

BEFORE proceeding to the consideration of the diseases of the abdomen and its contained organs, it is necessary to point out the various methods of *physical examination* which may be employed in their investigation; and to indicate the information which each of them is capable of affording. In order to make this examination satisfactorily, the abdomen should be properly exposed, and the patient placed in an appropriate position. The best posture ordinarily is on the back, with the head and shoulders considerably raised, and the knees and thighs bent, so that the abdominal muscles may be relaxed; however, it is requisite in many cases to make the patient assume other positions, such as lying on either side or on the face, or kneeling supported on the hands. The patient should be desired to breathe deeply, or the attention may be occupied with conversation, so that a state of contraction and tension of the abdominal muscles may be avoided, which is very apt to be produced. The examination should be carried out carefully and thoroughly, and not uncommonly it has to be made on more than one occasion, before a satisfactory conclusion can be arrived at.

The following outline indicates the different modes of examination which might be required in the investigation of any particular case,

though it does not often happen that they are all called for in the same individual. Some of them are similar to those employed in the exploration of chest-affections, though their relative value is very different; others are peculiar to the examination of the abdomen.

I. Inspection.—By this method is ascertained:—1. The state of the superficial parts, viz., the integuments, superficial veins, and umbilicus. 2. The general shape and size of the abdomen; as well as any local alteration in these respects. 3. The characters of the abdominal respiratory movements. 4. The presence of any visible pulsation. 5. Certain movements, such as those due to flatus; to fluid, when the position of the patient is altered; or to the presence of a foetus.

II. Application of the Hands, Palpation, or Manipulation.—If properly carried out, this becomes one of the most valuable methods of examination in the investigation of diseases of the abdomen; but it requires considerable practice, and manipulation has to be employed in different ways in different cases.

Palpation reveals:—1. The condition of the abdominal walls, as regards amount of fat, œdema, and the state of the muscles. 2. The shape and size of the abdomen more accurately than inspection. 3. The sensations conveyed as regards mobility of the abdomen as a whole, degree of resistance, consistence, fluctuation, regularity and smoothness or the reverse, over the surface generally, and over its different parts. 4. The existence of any enlarged organ or tumour, as well as its position and characters. 5. The extent of the respiratory movements, and their influence upon any tumour which may be present. 6. The situation and characters of any pulsation. 7. The presence of friction-fremitus developed during the act of breathing. 8. Any movements set up within the abdomen, such as gurgling from accumulation of gas in the intestines, or foetal movements.

III. Mensuration or Measurement.—Merely an ordinary single and double measuring tape of sufficient length are required for measurement, and this affords exact information as to the size of the abdomen; and as to the diaphragmatic respiratory movements. It is particularly valuable as showing the progress of many cases, with the effects of treatment. The measurements ordinarily required are:—1. *Circular* in different parts, but especially a little above and below the umbilicus. 2. *Semicircular*, so as to compare the two sides. 3. *Local*, viz., from the umbilicus to the ensiform cartilage; to the pubes; and to the anterior superior spine of the ilium on each side.

IV. Percussion.—*Mediate* percussion must usually be practised in connection with the abdomen. A modification of this method is employed in the production of what is termed *hydatid-fremitus* or *vibration*, which is elicited by applying three fingers of the left hand firmly over certain cystic tumours, and striking the middle finger suddenly with the point of the right middle finger. Another method consists in applying the fingers of one hand over one side of the abdomen, and tapping or flipping the opposite side with those of the other hand, which is the usual plan for producing fluctuation.

The objects for which percussion of the abdomen is practised are:—

1. To bring out certain sounds.
2. To realize certain sensations com-

municated to the fingers, especially the *degree of resistance*; *hydatid-fremitus*; and *fluctuation*. The sounds elicited may be grouped under the terms *dulness* and *tympanitic sound*, these necessarily varying in their exact characters. In the normal state they are both met with over different parts of the abdomen, according to the organ which corresponds to the point percussed, and by this mode of examination the exact position and limits of most of the organs can be marked out. The deviations from health, as regards sound, which may be observed, are:—(i.) Excess in the intensity, clearness, or extent of the tympanitic sound. (ii.) Dulness, either too extensive, or in unusual positions. The last is the deviation which requires most attention, and when any abnormal dulness is detected, it is necessary to make out carefully:—*a.* Its site, exact limits, and shape. *b.* Whether it differs according as superficial or deep percussion is made. *c.* If it is influenced by posture; the act of breathing; pressure; or manipulation: while in some doubtful cases it may be requisite to observe the effects upon the percussion-sound of taking food or drink; of the act of vomiting; the use of an enema; or the removal of urine by a catheter. With respect to *resistance*, by noticing its degree an accumulation of fluid may be distinguished from a solid mass, and the actual density of the latter can to a great extent be realized; the sensations on percussion are likewise useful in separating flatulent distension of the abdomen from enlargement due to the presence of fluid.

Hydatid-fremitus is a peculiar vibrating or trembling sensation, produced in the manner already described, and formerly supposed to be characteristic of hydatid tumours, but it can be brought out in connection with any large cyst which has thin and tight walls, and which contains a fluid of watery consistence.

Fluctuation indicates the presence of fluid within the cavity of the abdomen, and it is needful to observe the degree of facility of its production, and its distinctness; the part of the abdomen over which it is felt; and whether it is influenced by change of posture: thus information is obtained as to the quantity of fluid, its freedom or limitation by cysts or adhesions, and its consistence. It must be borne in mind that a relaxed or very fat condition of the abdominal walls may give rise to a sensation simulating fluctuation.

V. Auscultation.—This is not nearly so useful a mode of examination in connection with the abdomen as in the case of the chest, and it need scarcely be mentioned that the intervention of a stethoscope is always advisable when practising it. Auscultation generally only gives negative information, except in cases of pregnancy, but sometimes by its aid certain positive signs are detected, viz.:—1. Friction-sound or grating, heard during the act of breathing, and due to exudation on the peritoneum, or to roughness of the surface of certain organs. 2. Murmurs in connection with aneurism, with regard to which it is requisite to notice their site, intensity, extent of conduction, synchronism, pitch, and other characters; as well as any effects produced upon them by pressure, or by change of position. 3. A murmur over the aorta, or over one of the common iliac arteries, due to pressure, such as that of a tumour. 4. Unusual conduction of the heart-sounds over the abdomen. 5. Sounds due to the movement of flatus

in the intestines ; or to the falling of food or liquid into the stomach, when swallowed. 6. Fluctuation or splashing-sound, elicited by shaking the patient, and indicating the presence of both air and fluid. 7. Murmurs and sounds heard in connection with the pregnant uterus.

In the majority of cases the methods of examination thus far considered are sufficient for establishing a diagnosis ; but there are others which might be called for in doubtful cases, and from which much aid may be derived. At present it must suffice to enumerate them, as illustrations of their usefulness will be given hereafter.

VI. Examination directed to the Alimentary Canal.—This generally includes :—1. The passage of a probang into the stomach, the end being felt through the abdominal walls, which helps in making out dilatation of this organ. 2. Examination of materials discharged from the stomach, and it has even been recommended to make use of the stomach-pump, and thus obtain some of the food at different stages of digestion. 3. The use of purgatives and enemata, in order to clear out the bowels, which should never be neglected in doubtful cases, the effects being noted ; or the injection of a quantity of water or gas per anum. 4. Examination of the anus and rectum, by inspection, the speculum being employed if required ; by the aid of the finger or hand ; or by the bougie. 5. Examination of the stools.

In order to test the efficiency of the pyloric orifice, it has been recently recommended to administer first a solution of carbonate of soda, and afterwards one of tartaric acid, and to determine by percussion whether the carbonic acid gas thus generated passes readily through the pylorus, or remains in the stomach.

VII. Examination per Vaginam, as described in obstetric works.

VIII. Examination of the Bladder and Urine.—The use of the catheter must always be thought of, but especially when there is any reason to suspect an accumulation of urine in the bladder. It may also be requisite to examine this organ with the sound. In all cases it is absolutely necessary to *examine the urine* carefully.

IX. Exploratory puncture with a small Trochar, or with the Aspirateur.—This is done for the purpose of determining the presence and nature of fluid within the abdomen.

X. Administration of Chloroform.—This may be required in order to aid in carrying out other modes of examination : while it at once determines the nature of the so-called *phantom-tumour* of the abdomen.

Physical examination of the abdomen aids chiefly in investigating the following abnormal conditions :—1. General enlargements. 2. General retraction or depression. 3. Local enlargements, or so-called *tumours*. 4. Diminution in the size of organs ; as well as certain changes in their physical characters, either with or without alteration in dimensions, for instance, cirrhosis of the liver. 5. Pulsation associated or not with any change in shape or size. 6. Interference with the abdominal respiratory movements from various causes.

General and local abdominal enlargements are of very common occurrence, and therefore, although this will involve some repetition, it may perhaps be of service to indicate specially the course of investigation

to be pursued, and the points to be observed in conducting a physical examination with the view of arriving at a diagnosis as to the cause of any such enlargement.

I. General enlargements.—1. Examine as to the state of the abdominal walls, by inspection and palpation, paying particular attention to the characters of the umbilicus. 2. Ascertain the degree of enlargement, and its exact form, by inspection, palpation, and measurement. 3. Note the extent of the abdominal respiratory movements, by the same methods; and observe whether they give rise to any sensation of fremitus. 4. Manipulate thoroughly over every part of the abdomen, in order to determine the sensations conveyed as to smoothness and regularity, amount of resistance, consistence, gurgling, &c. 5. Observe specially if there is any feeling of fluctuation, as well as its seat, extent, and facility of production. 6. Percuss carefully, noting the sounds elicited over the abdomen in different parts, and the sensations conveyed to the fingers during the act. Sometimes it is requisite to examine for hydatid-fremitus. 7. Apply the stethoscope, chiefly to ascertain whether any kind of friction-sound can be heard during the act of breathing; if there are any of the sounds usually observed in connection with a pregnant uterus; or a pressure-murmur over either iliac artery. 8. Having examined thus far as the patient is lying in the ordinary position, it is then necessary to observe the effects of various changes of posture, especially as regards the shape of the abdomen; the percussion-sounds; and any fluctuation which may be present. 9. If after this a satisfactory diagnosis cannot be made, it will be requisite to have recourse to the other methods of examination mentioned, particularly examination by the rectum or vagina; and the employment of the aspirateur or exploratory trochar. Of course the urine should always be thoroughly tested.

II. Local enlargements.—Manipulation is by far the most important mode of examination which can be employed in the investigation of localized abdominal tumours, and therefore it is specially necessary to educate the sense of touch for these cases. 1. Any local change in the skin, limited œdema, or enlargement of veins, must be noted. 2. A cursory examination is desirable, in order to determine if there is but one tumour or more; and, in the latter case, whether they are separate or connected. The further remarks will apply to each enlargement, should there be more than one. 3. Ascertain the precise situation of the tumour, paying particular attention to the following points:—*a.* Whether it extends into the pelvis. *b.* If it is median, or occupies one or other side, and to what extent. *c.* If it can be traced within the margin of the thorax; and if it enlarges the lower part of this cavity, or alters the intercostal spaces in any way. *d.* Whether it corresponds to, or can be made out to be part of, either of the organs. *e.* Its depth, noting whether it lies in the abdominal walls; within the cavity of the abdomen near the surface; or deep down near the spine. 4. Mark out the dimensions and shape as nearly as possible, observing the form of the margin; if this is well or ill-defined; and if the outline corresponds to that of any abdominal organ. 5. Feel carefully over the surface and margins, in order to determine whether they are smooth, granular, nodular, or

lobular, noticing the characters of any prominences which may exist; and at the same time try to realize the consistence, which may be more or less hard and firm, elastic, doughy, fluctuating, &c. It is important to observe whether the sensations are uniform or not over the enlargement; and if any change is produced by pressure and manipulation, or if any gurgling or grating is thus elicited. 6. Ascertain whether the tumour is movable or fixed, as well as the degree of mobility, both by manipulation, and under the influence of the respiratory movements. 7. Should there be any pulsation or thrill, the exact seat and characters of each must be noted. 8. Percussion is, of course, most valuable in bringing out sounds and tactile sensations, and in many cases the precise limits and characters of an enlargement can only be made out in this way. It is important to notice whether the results of percussion are uniform over its entire surface or not. 9. Auscultation is sometimes useful, especially in order to investigate murmurs, which may be associated with the tumour itself, or be the consequence of its pressure upon an artery. 10. The posture must be altered, as in the case of general enlargements, and the effects observed, as regards the site of the tumour; its percussion-sound; or any changes affecting fluctuation, pulsation, or murmur, should either of these be present. 11. Without again recapitulating the more unusual methods of examination, it may be stated that either or all of them may be called for in doubtful cases, and under any circumstances it is most desirable that the bowels should be thoroughly emptied by the use of purgatives and enemata, collections of fæces may cause much obscurity, and not uncommonly simulate tumours of a very serious nature.

CHAPTER XIII.

DISEASES OF THE PERITONEUM.

1. ACUTE PERITONITIS.

ÆTIOLOGY.—Peritonitis may be divided into certain varieties, according to its mode of causation, viz.:—1. **Traumatic.** This form may arise from mere external injury to the abdomen; penetrating wounds; or rupture by violence of internal organs. It must be remarked, however, that the danger of peritonitis from direct injury has been much exaggerated, as the membrane is often considerably injured in operations without any particular harm resulting. 2. **Perforative.** The special causes of this important variety of peritonitis will be separately considered. 3. **Irritative.** In not a few instances peritonitis arises from some local irritation, being then either limited, or spreading throughout the sac. Thus it may be associated with diseases of organs; hernia or intestinal obstruction; ulceration of the bowels; morbid deposits, especially acute military tubercle; inflammation and abscess of the lacteal glands: or it may be the result of extension of inflammation through the diaphragm from the pleura or pericardium. The source

of local irritation may be very obscure, requiring to be carefully sought after. 4. **Secondary**, from blood-poisoning. Peritonitis from this cause is especially important in connection with the puerperal state and Bright's disease. It may also be met with in the course of small-pox, typhoid fever, pyæmia, erysipelas, glanders, gout, rheumatic fever, and other diseases. In some of these cases it has been supposed to be metastatic. 5. **Idiopathic**. Under this head are included those cases of peritonitis which cannot be traced to either class of causes above mentioned, but which are attributed to cold, over-eating or drinking, and other injurious influences. Many doubt the existence of this variety, but exceptional cases come under observation which certainly seem fairly to belong to this class. 6. **Puerperal peritonitis**, which can most probably be conveyed by contagion.

Predisposing causes. Children are only very rarely attacked with acute general peritonitis, and in such subjects it is usually associated with some exanthematous fever. Certain forms of blood-poisoning, but especially that connected with renal disease, are very favourable to the occurrence of peritonitis from any slight irritation. Puerperal peritonitis may assume an epidemic form.

ANATOMICAL CHARACTERS.—The special features in the morbid anatomy of peritonitis which seem worthy of notice, as distinguishing it from other serous inflammations, are as follows:—The vascularization is often very intense, and is most marked where the coils of intestines touch. The subserous tissue and the muscular coat of the alimentary canal are usually much sodden, infiltrated, and softened. The lymph, though not uncommonly tolerably firm, matting together the coils of intestines, yet appears to be more frequently of a soft, non-organizable nature than in other serous inflammations, and flakes of it are always detached in abundance, or even gelatinous-looking masses of considerable size may be observed. In some instances it presents a greasy appearance. The effusion is as a rule comparatively small in quantity, and the explanation of this may be that the intestines are generally so distended with gas, that they prevent much accumulation of fluid. This fluid is always more or less flaky and turbid, and not uncommonly presents an almost purulent appearance, occasionally being actually purulent, especially in puerperal and other low forms of peritonitis. Sometimes there is an admixture of blood. Much foetid gas is frequently present in the peritoneal sac, and in certain cases foreign materials are found there. Gangrene is occasionally observed. The morbid products of peritonitis are in some instances of the most virulently septic character, and the introduction of the minutest quantity into the system is highly dangerous; hence special care should always be taken in conducting a post-mortem examination in cases of this disease.

According to the extent of the inflammation, peritonitis is named *general* or *local*, the former term merely indicating that it is extensive, for the entire surface is but rarely involved. The local varieties are named according to the part affected, such as *parietal*, *hepatic*, *omental*, or *nephritic*.

Should recovery take place, thickenings, agglutinations, or bands of adhesion form, which subsequently may prove highly dangerous.

SYMPTOMS.—Peritonitis presents considerable variations in its clinical history, but it will be convenient first to describe a typical case, and then to point out the principal forms which call for special notice.

The *onset* or *invasion* of the disease is usually definite and marked, being attended with distinct, and often severe and repeated rigors. These are soon followed, sometimes accompanied, or rarely even preceded by local symptoms referable to the abdomen and its contents; with evidences of constitutional disturbance. Some of the main symptoms are due to irritation of organs excited by the inflamed peritoneum; or to paralysis of the muscular coat of the hollow viscera, especially of the stomach and bowels. The symptoms may therefore be considered as *local* and *general*.

Local.—Pain over the abdomen is in most cases a prominent symptom. It usually begins locally, especially below, but may ultimately extend over the entire surface, though it is frequently more marked in some particular region. Its intensity and characters vary much, but it is generally very severe, sometimes agonizing; and hot, burning, shooting, or darting in character. Any disturbance of the parts increases the pain considerably, such as that induced by change of posture, a deep breath, coughing, vomiting, defæcation, or even the movement of flatus in the intestines. There is extreme tenderness, especially on making deep and limited pressure, but in some cases even the weight of the bed-clothes cannot be borne. The alimentary canal is gravely affected, as evinced by a very small, irritable, red tongue, slightly furred, and tending to dryness; complete loss of appetite, with great thirst; nausea, and vomiting of everything swallowed; and absolute constipation.

General.—The appearance of the patient is often highly characteristic. The face, pale or flushed, presents an expression of evident suffering and grave constitutional disorder, combined with anxiety, the features being drawn and pinched. *There is much prostration, with general uneasiness and restlessness, but though the arms may be thrown about, the patient keeps the body perfectly still, on account of the pain which movement causes, and instinctively assumes a characteristic posture, with the view of relaxing the abdominal muscles, namely, lying on the back, with the head and shoulders raised, the thighs bent, and the knees drawn up and flexed.

Pyrexia is usually, but not always, present to a very marked degree; but there is no regularity in the temperature. The pulse is increased in frequency, ranging from 100 to 150 or more, small, sharp, often hard, and wiry or thready; in bad cases it tends to become extremely frequent, feeble, and irregular. Its characters are clearly revealed by the sphygmograph. The blood is, in many cases, highly hyperinotic. Respiration is hurried, but shallow; while persistent hiccup causes much distress in some cases. The urine is markedly febrile, and not uncommonly contains albumen. It may be almost suppressed or retained. Micturition is sometimes very frequent. As a rule no particular cerebral symptoms are observed, except headache and sleeplessness; in bad cases, however, low muttering delirium may set in, or in puerperal peritonitis the delirium is sometimes of a wild type.

Physical examination of the abdomen reveals some important signs in cases of acute peritonitis, viz.:—1. *Tympanitic distension*, often extreme. 2. Absolute cessation of all *abdominal respiratory movements*. 3. Occasionally *friction-fremitus* or *sound*, if the patient can be made to breathe deeply, especially over the liver, due to the presence of lymph. 4. Usually signs of a certain amount of fluid, viz., *dulness* in dependent parts; with in some instances a sense of *fluctuation*, movable with change of posture.

COURSE AND TERMINATIONS.—Peritonitis is a very fatal disease, death being usually preceded by extreme prostration and collapse, as indicated by the aspect of the features; cold, clammy sweats; coldness of the extremities; and an extremely rapid, feeble, and irregular pulse. The pain in the abdomen often ceases, sometimes suddenly, and the tympanitis may disappear. Sometimes large quantities of a dark fluid containing altered blood are expelled from the stomach and bowels, without any effort. Low nervous symptoms usually set in, but the intellect may remain clear almost to the last. Occasionally death seems to result from asphyxia or coma. Should recovery take place, there is a gradual subsidence of the symptoms, and among the chief signs of improvement are a favourable change in the expression; increase in the force and fulness of the pulse, with a more satisfactory sphygmographic tracing; relief of constipation; and increase in the quantity of urine. Peritonitis is said to terminate occasionally by *crisis*, with critical discharges, but this must be an extremely rare event.

VARIETIES.—The special forms of peritonitis requiring notice are as follows:—1. **Perforative**, which will be separately considered. 2. **Latent**. Cases are sometimes observed in which there is extensive peritonitis without any symptoms at all; or none of any definite character. This may be due to the mental condition of the patient, but not always. A remarkable illustration of this variety came under my care at University Hospital, in which there were absolutely no local signs of peritonitis, and yet this was the only lesion found after death. 3. **Adynamic**. Here there is a rapid tendency towards the typhoid condition, with a dry and brown tongue, sordes on the teeth, and low nervous symptoms. 4. **Erysipelatous**. Puerperal peritonitis is the best illustration of this form, in which the inflammation is very extensive, intense, and rapid in its progress, the products being remarkably non-plastic, consisting chiefly of a purulent-looking fluid, often very abundant. The symptoms are proportionately severe, and of a low type. This variety is also observed after low fevers sometimes; and in cases of pyæmia. 5. **Local**. When peritonitis is limited to, or more marked over some particular organ, the pain may be localized, and symptoms connected with this special organ become prominent. When the parietal peritoneum or great omentum is involved, there is extreme superficial pain, with marked tenderness. 6. The symptoms of peritonitis may be modified by **complications**. Of these the most important is *muco-enteritis* which may give rise to diarrhoea instead of constipation.

DIAGNOSIS.—It is important to bear in mind the possibility of peritonitis being *latent*, should there be any condition present likely to originate this disease. The principal affections from which it has to be dis-

tinguished are cramp or colic; muscular rheumatism of the abdominal walls; enteritis; enteralgia and other neuralgic painful affections within the abdomen; the passage of a gall-stone; and certain cases of hysteria, attended with tympanitis and other local symptoms closely simulating peritonitis. The diagnosis is founded on:—1. The *history* of the case, as to the *exciting cause* and *mode of onset*. 2. The *aspect* of the patient, which usually suggests grave constitutional disturbance in peritonitis, while there is no evidence of hysteria. 3. The *posture* of the patient, and state of absolute rest as regards the body. 4. The *local symptoms*, especially the severity and characters of the pains; marked tenderness, which is not merely superficial, but also deep; urgent vomiting; and obstinate constipation. 5. The *physical signs*, as evidencing great tympanitis, with a certain amount of fluid, and possibly the presence of lymph. 6. The existence of more or less *pyrexia*, often accompanied with special characters of the pulse, tongue, and urine.

PROGNOSIS.—Peritonitis is always a highly dangerous affection, but its gravity differs materially according to its cause. *Perforative* peritonitis is extremely fatal; and next in order of danger come the *puerperal* form, and those cases which are associated with pyæmia and other forms of blood-poisoning. *Traumatic* and *local* varieties are much less serious. Among the unfavourable symptoms may be mentioned typhoid and low nervous phenomena; and great dyspnoea. The condition of the pulse, especially as revealed by the sphygmograph, will assist in determining the prognosis. The duration of fatal cases may vary from twenty-four or forty-eight hours to three or four weeks, but they do not often extend beyond a week.

TREATMENT.—No exact rules for the treatment of peritonitis can be laid down, as the management of this disease has to be materially modified in different cases, and it will be only practicable to indicate the general principles which are to be followed, and the main remedies for carrying them out. It must be premised that any cause which is setting up or intensifying peritonitis must be at once removed, if possible, and should be carefully sought for in doubtful cases, as for instance an intestinal hernia. The main principles of treatment are:—1. To procure rest for the affected parts. 2. To subdue the inflammation, and promote the removal of the inflammatory products. 3. To sustain the strength of the patient. 4. To treat various symptoms as they arise.

The *removal of blood* by venesection, or by the application of a large number of leeches over the abdomen, is a measure which is very commonly adopted in the treatment of peritonitis, and certainly it seems to be more serviceable in this than in other scrous inflammations; but at the same time there are very many cases for which bleeding is by no means suitable, so that all the circumstances of each individual case must be carefully considered before having recourse to this treatment. It is when extensive peritonitis occurs in a healthy, strong, and plethoric subject that withdrawal of blood is indicated, and then only in the early stages of its progress. When the disease is associated with blood-poisoning, or with a low condition of the system; if the patient is weak, either constitutionally or from any pre-existing illness; or if the in-

flammatory process is far advanced, it is decidedly injurious to take away any blood. The balance of evidence is opposed to bleeding in puerperal peritonitis. The application of leeches is much preferable to venesection, the number employed varying from 10 to 20, 30, or even more in appropriate cases.

Mercurialization, by means of calomel administered with opium, is another very common mode of treatment adopted in cases of peritonitis, but it appears to me to be as useless, or even injurious, in this as in other serous inflammations. Opium is a remedy of the utmost importance. It not only relieves symptoms, especially pain and vomiting, but also prevents the peristaltic action of the bowels, and thus contributes greatly to the maintenance of rest. It is best given in the form of pill—gr. $\frac{1}{2}$ —ij, repeated every two, three, or four hours according to circumstances. If there is renal disease, opium can only be employed very cautiously. Morphia, either administered as a pill—gr. $\frac{1}{4}$ — $\frac{1}{2}$, or by subcutaneous injection, is also highly valuable in some cases. Where the stomach is extremely irritable, tincture of opium may be introduced by enema. Other *anodynes* may be given when opium is inadmissible. Quinine in full doses has been recommended, and in low forms of peritonitis it might probably be administered with much advantage along with opium. Aconite and digitalis have also been employed in some forms of peritonitis.

The *diet* requires the most careful attention. Only liquids should be given, cool or even cold, and they must be administered in small and definite quantities, at stated intervals. Frequently abundant nutriment is required, especially in the form of milk and well-made beef-tea. In many instances also *alcoholic stimulants* are needed, and in low forms of peritonitis these are the only remedies on which reliance can be placed. The sucking of ice is highly to be commended; or small quantities of iced drinks might be allowed. In many cases it is requisite to have recourse to nutrient enemata, especially when the stomach is very irritable.

Local applications over the abdomen are of decided value. The most serviceable are hot linseed-meal poultices, not too heavy, sprinkled over with laudanum, and changed frequently; and warm anodyne or turpentine fomentations, for applying which spongio-piline is useful. Sinapisms may also prove beneficial. Some authorities recommend the employment of cold compresses, frequently changed. In tubercular peritonitis Dr. McAll Anderson uses constant applications of flannels dipped in iced water. In the more advanced stages a blister might be beneficial in some cases. It is often desirable to employ some apparatus for the purpose of keeping off the weight of the bed-clothes from the abdomen.

The chief *symptoms* requiring attention are pain; vomiting; tympanitis; constipation or diarrhoea; urgent dyspnoea; and those indicative of adynamia. The remedies already considered will assist in relieving most of these symptoms. Sickness should be combated by means of small quantities of an effervescent mixture with hydrocyanic acid and morphia; soda-water and milk; the sucking of lumps of ice; or creosote in drop doses. Tympanitis is best relieved by enemata of turpentine; or by the passage of a long tube per rectum. Puncture of

the colon with a minute trochar or the aspirateur may be had recourse to in extreme cases, if other measures fail. With regard to constipation, in some instances it is desirable to endeavour to clear out the bowels at the outset by a full dose of calomel, and afterwards to employ enemata; but when there is perforation, on no account must the bowels be disturbed. Diarrhoea is best treated by enemata of starch and tincture of opium (m xv—xxx). Dyspnoea is usually relieved by removing the tympanitic condition. Adynamic symptoms call for ammonia and bark, or turpentine internally; along with abundance of alcoholic stimulants and nutritious liquid food.

II. CHRONIC PERITONITIS.

ÆTIOLOGY.—Chronic peritonitis is observed:—1. As a sequel of one or more acute attacks. 2. After repeated paracentesis for ascites. 3. In connection with chronic diseases of certain abdominal organs, such as cirrhosis or cancer of the liver, or chronic ulcer of the stomach or intestines. 4. Associated with some diathesis, especially when this leads to a morbid formation in the peritoneum, such as cancer or tubercle, but chronic peritonitis may also arise in connection with Bright's disease, and possibly from rheumatism.

ANATOMICAL CHARACTERS.—These necessarily vary greatly in different cases, but in a general way they may be described as thickening of the peritoneum, sometimes carried to an extreme degree; adhesions, in the form of bands, or of extensive matting together of the organs; accumulation of more or less fluid, which ranges from mere serum to actual pus, or has an admixture of blood, and is often confined in loculi limited by the adhesions. In some cases large masses of organized lymph are seen; and much pigment is often present. Caseous degeneration may have taken place in parts; or cancer or tubercle may be evident.

SYMPTOMS.—In some cases there are no clinical evidences of chronic peritonitis, or only such as are very obscure; in others merely *physical signs* are observed. When present the symptoms include various subjective sensations in the abdomen; disturbance of the alimentary canal; sometimes evidences of pressure; with generally more or less constitutional disorder. Abdominal uneasiness or more or less actual pain may be experienced, which, however, is never severe, liable to come and go, often colicky, and increased by shaking the body. Sometimes there is a sense of local soreness or heat. Tenderness is common, being frequently more marked in particular spots. The digestive organs are generally disturbed, but it is often difficult to say how far this is due to the peritonitis. This affection does, however, tend to give rise to constipation, and the bands of adhesion may lead to absolute intestinal obstruction. In chronic tubercular peritonitis diarrhoea is common, owing to intestinal ulceration. Occasionally jaundice, ascites, or anasarca of the legs are observed, as the result of pressure on the common bile-duct, or on certain veins. More or less emaciation; a dry and harsh skin; occasional pyrexia, tending towards a hectic type; and other general symptoms often indicate constitutional disturbance, but it is probable

that these are in most cases chiefly due to the condition with which the peritonitis is associated.

Physical examination often yields important information. 1. The abdomen is liable to be *enlarged*, and this may be the first thing which has attracted the patient's attention. The enlargement is never very great; and it is usually regular in shape, though not always quite symmetrical. 2. The *sensations* on palpation are seldom uniform over the entire surface. Fluctuation may be detected in parts, but only indistinctly; while it is often very limited, or is felt in unusual situations, owing to the fluid being enclosed in locular spaces. In other regions there may be a more firm and solid sensation, or even distinct tumours may be detected sometimes. The abdomen may be curiously movable as a whole. 3. *Dulness* is frequently very extensive, owing to the arrangement of the fluid, and it may lie chiefly in front. In some instances tympanitic and dull sounds are heard over contiguous and irregular spots. There may be a sense of much *resistance* on percussion. 4. *Friction-fremitus* and *sound* can sometimes be detected. 5. *Change of posture* frequently produces little or no effect, on account of the fluid being loculated.

TREATMENT.—The main indication in most cases is to treat the *constitutional state* with which chronic peritonitis is associated, by means of cod-liver oil, tonics, mild ferruginous preparations, light nutritious diet, a suitable climate, and proper hygienic conditions. Iodide of potassium or iodide of iron may be tried internally, with the view of removing the inflammatory products; as well as *local counter-irritation* over the abdomen, especially by the means of iodine liniment or ointment. This region should be covered with cotton-wool and well bandaged. I have known considerable benefit follow in simple cases from systematic pressure, by carefully bandaging the abdomen. Pain and constipation must be relieved by the usual means, but caution must be exercised in giving opium, and also in administering strong purgatives. Hot air or vapour-baths may be useful if the peritoneum contains much fluid.

III. MORBID GROWTHS IN THE PERITONEUM.

The most important morbid formations met with in the peritoneum are *tubercle* and *cancer*. *Hydatids* are occasionally found; and very rarely tumours of other kinds. The folds of the peritoneum, especially the omentum, frequently enclose a great quantity of fat.

Tubercle occurs in the peritoneum, either over limited patches corresponding to intestinal ulcers; as part of acute milary tuberculosis; or extensively, secondary to tubercle in other parts.

Cancer is met with in the form of scirrhus, encephaloid, or colloid, the omentum being a comparatively frequent seat of the last-mentioned variety. Usually the peritoneum is involved secondarily, by extension from one of the abdominal organs, but in rare instances it is affected primarily and solely.

These morbid growths tend to originate *ascites*, or *acute or chronic peritonitis*, and it is to these conditions that their local symptoms are mainly due. Sometimes fluid collects with extreme rapidity in cancer. There may also be more or less general symptoms. *Colloid in the omentum* yields

the following physical signs :—1. The enlargement of the abdomen may be very great, but is wanting in uniformity ; the umbilicus appears stretched, but not everted. 2. Firm irregular masses can generally be felt, and even if fluid is present, fluctuation is very indistinct. 3. Dulness is usually elicited over the front of the abdomen. 4. Change of posture produces no effect, unless there is much fluid present. 5. The aspirateur or exploratory trochar may bring away a slimy gelatinous fluid ; and this is occasionally discharged by vomiting, or per rectum.

IV. ABDOMINAL PERFORATIONS AND RUPTURES.

Apart from the effects of traumatic injury, *perforations* and *ruptures* are liable to take place in connection with the abdominal contents, and in order to avoid repetition, it will be convenient to indicate the chief facts pertaining to this subject in the present chapter, as the peritoneum so commonly suffers in these cases.

ÆTIOLOGY AND PATHOLOGY.—The principal structures which are liable to give way, and the pathological conditions which cause these lesions, may be thus summarized :—1. Perforation of the stomach or intestines from within, in connection with ulceration or the resulting cicatrices ; gangrene ; cancer ; the action of corrosive poisons, especially on the stomach ; or mechanical irritation and destruction, particularly by foreign bodies introduced from without, but sometimes merely by hardened fæces, worms, or gall-stones. It must be mentioned that extensive *post-mortem* softening and destruction of the coats of the stomach may, under certain circumstances, result from the action of the gastric juice. 2. Rupture of an abscess or hydatid cyst in the liver. 3. Perforation of the gall-bladder, either by gall-stones which have caused ulceration ; or from cancer. 4. Rupture of the spleen, from extreme enlargement and softening ; or abscess. 5. Various ruptures in connection with the uterus and ovaries. 6. Bursting of any accumulation in the pelvis of the kidney ; of an abscess or cyst in this organ ; or of the bladder from over-distension. 7. Bursting of an abscess unconnected with any organ ; or of a soft morbid accumulation in the absorbent glands. 8. Rupture of an aneurism. 9. Perforation of a hollow viscus from without, owing to the destruction of its coats by some solid tumour. 10. Bursting of a peritoneal accumulation. 11. Very rarely perforation of the diaphragm, with escape of some fluid collection from the chest into the abdominal cavity.

These lesions usually occur without any immediate *exciting cause*, but certain of them may be brought on by some mechanical disturbance, such as vomiting, coughing, or laughing ; straining at stool ; or, in the case of ulceration of the alimentary canal, by indulging in excess of, or in irritating articles of food, or in such articles as cause flatulent distension.

ANATOMICAL CHARACTERS.—The perforation or rupture may take place into different parts, and the pathological consequences will vary accordingly. 1. Most frequently the opening communicates with the peritoneum, into which foreign matters are poured more or less freely,

exciting *perforative peritonitis*, severe and rapid in proportion to the quantity and irritant nature of the materials thus introduced into the sac. . 2. Sometimes the opening takes place into the subperitoneal cellular tissue, local inflammation, ending in the formation of abscesses, being set up in this structure. 3. Not uncommonly one hollow organ forms an adhesion with another, and when perforation occurs, a communication is established between the two viscera; or it may unite with a solid organ, and when perforation is completed, this organ may make up for the deficiency, and thus prevent serious symptoms. 4. Union may be set up with the abdominal wall, so that ultimately the opening is formed on the external surface.

SYMPTOMS.—From the facts just stated, it will be evident that the symptoms indicating perforation must differ considerably, and there may be none at all, or death may take place almost instantaneously, as from rupture of an aneurism. As a rule there have been previous signs of some morbid condition in connection with which the lesion occurs. Presuming the perforation to be sudden and of any extent, and that the communication takes place into the peritoneal cavity, this event is usually indicated by a sudden intense pain at the seat of rupture, often of a burning character, which spreads rapidly over the abdomen, being sometimes attended with a feeling as if something were pouring out; while at the same time there are the ordinary signs of more or less collapse or shock, and death may rapidly ensue from this cause. Should the patient rally, peritonitis will be speedily set up, the peculiar features of which are that the local symptoms precede any rigors; that the pain starts as a rule from a certain spot; that the course of the disease is usually very rapid; and that the termination is almost always fatal. If the perforation takes place into the cellular tissue, there will be signs of local inflammation, followed by abscess; with general pyrexia. The attacks of sudden pain and collapse may be repeated, this probably indicating extension of the perforation, or the formation of fresh communications.

DIAGNOSIS.—If any morbid condition is known to exist in the abdomen which might lead to perforation, the sudden occurrence of the local and general symptoms indicated above would justify the diagnosis of this untoward event, and the subsequent course would probably soon clear-up any doubt. Should there have been no previous evidence or knowledge of such a condition, however, there is often much obscurity, but perforation must always be borne in mind when urgent abdominal symptoms set in, accompanied with signs of collapse or shock.

PROGNOSIS.—This is always exceedingly grave, but the termination is not invariably fatal. Much will depend upon the condition of the patient; the cause of the perforation; the structure into which it takes place; its extent, and other circumstances.

TREATMENT.—In any case of abdominal perforation the patient must be kept absolutely at *rest*, and this applies still more emphatically to the organ which is the seat of the lesion. In the case of the stomach or bowels, there should be complete abstinence from food by the mouth, and only small enemata administered. Opium is the great remedy for the purpose of counteracting shock, relieving pain, and checking peristaltic action. It should be given in full doses, at short intervals. Collapse must also be treated by free administration of *stimulants*, which, if the alimentary

canal is affected, must be given by enemata; application of heat to the extremities; and the use of sinapisms. Hot fomentations may be applied over the abdomen. Should peritonitis or other form of inflammation be set up, appropriate treatment must be adopted. After perforation of the stomach and intestines, it is extremely important to avoid giving anything by the mouth for some time; and to refrain from any attempt to act upon the bowels by means of aperients.

V. ASCITES.—DROPSY OF THE PERITONEUM.

ÆTIOLOGY.—Ascites is merely a localized dropsy of the peritoneum, and the chief causes from which it may result are:—1. Pressure upon the branches of the portal vein within the liver, especially from cirrhosis and other forms of chronic contraction of the liver; or infiltrated cancer. 2. Pressure upon the portal trunk in the fissure outside the liver. It is from this cause that ascites is most frequently associated with many diseases of the liver, such as cancer, albuminoid disease, hydatids, or abscess; either projections from the liver pressing on the vein, or the glands in the fissure being simultaneously affected. Inflammatory thickening from peri-hepatitis; any tumour in the vicinity; or an aneurism may also cause pressure on the portal trunk. 3. Internal obstruction of the portal vein by a thrombus. 4. Pressure upon the inferior vena cava, after it receives the hepatic trunk. 5. Cardiac or pulmonary diseases obstructing the venous circulation, these in time originating organic changes in the liver. 6. Renal disease. 7. Chronic peritonitis; or morbid deposits in the peritoneum, the latter being supposed to act by inducing active congestion, but probably chiefly originating dropsy by causing pressure upon the small vessels, or even upon veins of some size. 8. Exposure to cold; suppression of discharges or of chronic skin diseases; and other causes which may lead to internal active congestion. The reality of this class of causes is questionable, but cases of ascites have been attributed to them.

ANATOMICAL CHARACTERS.—The quantity of dropsical fluid which may collect in the peritoneum varies extremely, but it not unfrequently amounts to several gallons. It distends and macerates the tissues in proportion to its amount. In characters it is usually in the main watery in consistence; clear and transparent; colourless or faintly yellow; alkaline in reaction, or very rarely neutral or acid. It may be turbid, dirty-looking, stained with bile or blood, gelatinous, or mixed with soft fibrinous masses. The composition of ascitic fluid is far from being uniform, but generally it contains much albumen; occasionally it yields fibrin, urea, or cholesterin.

SYMPTOMS.—The only symptoms directly due to ascites are those dependent upon the mechanical effects of the fluid. There is more or less discomfort and sense of fulness, in proportion to its quantity; or aching may be felt in the loins. Digestive disturbances are common, flatulence and constipation being often prominent symptoms, and sometimes vomiting takes place. Owing to the interference with the diaphragm, dyspnoea is complained of and may be urgent, being much increased often by flatulence, and by the recumbent posture. The heart's action

may also be disturbed, as evidenced by palpitation, irregularity, or sometimes a tendency to syncope. Anasarca of the legs is liable to follow ascites, resulting from pressure exerted by the fluid on the *inferior vena cava*, which also leads to enlargement of the veins of the abdominal wall. When ascites is caused by pressure on the *vena cava*, of course anasarca of the legs is observed simultaneously with, or even before the peritoneal dropsy. Albuminuria may be induced by pressure on the renal veins, the urine being also concentrated and deficient in quantity. The skin is often dry and harsh.

PHYSICAL SIGNS.—These require careful consideration, and in the majority of cases they are sufficiently characteristic, but they necessarily depend upon the quantity of fluid present. 1. The skin usually appears stretched to a variable degree, smooth, and shining, feeling thin; the superficial veins are often enlarged; and the umbilicus is stretched, everted or pouched out, and becomes finally obliterated. 2. The abdomen is more or less enlarged, in some cases enormously; quite symmetrical; and of a rounded form, though it tends to bulge in the flanks or in the hypogastric and iliac regions, according to the position of the patient. The greatest circumference is about the level of the umbilicus, which is the highest point of the abdomen; the thorax appears small and depressed, and its lower margin may be everted, or the ensiform cartilage is sometimes bent sharply up. Usually a history can be obtained that the enlargement commenced below; and that it increased steadily, though slowly in most cases. 3. Abdominal respiratory movements are frequently either deficient or absent; and breathing is generally hurried and shallow. 4. The surface of the abdomen feels quite regular and uniform; and fluctuation is generally readily elicited from side to side, or in other directions. 5. Dulness is observed first towards the lumbar regions, if the patient lies in the supine position; then in the lower part of the abdomen; and it extends by degrees towards the front and upwards, until finally it may be observed all over the abdomen. The umbilical region retains the tympanitic sound longest, and it is often excessive for a time in this part. When the patient sits up, the prominence in front between the recti becomes tympanitic. 6. Auscultation affords negative signs. 7. Change of posture gives important signs, viz., the fluid can occasionally be seen moving as the position is altered; the form of the abdomen is modified, bulging being observed in the most dependent part; while the seat of dulness and fluctuation is changed. 8. Examination per rectum reveals the sensation of the resistance of fluid. 9. Examination per vaginam indicates that the vagina is short, and the uterus pushed down or flexed; occasionally a pouch projects through the vulva. 10. Any fluid which is removed by tapping usually consists of mere serum, containing generally a considerable amount of albumin. 11. The heart may be displaced upwards and to the left, occasionally a basic murmur being thus originated.

DIAGNOSIS.—There are two chief points to be attended to in the diagnosis of ascites, viz.:—1. To determine whether fluid is present; and to distinguish enlargement due to this cause from that dependent upon other morbid conditions. 2. To make out the pathological cause of the dropsy. The chief *general abdominal enlargements* which may

simulate ascites are those associated with great obesity, with much fat in the omentum; a flabby relaxed state of the abdominal walls, with flatulence; considerable subcutaneous oedema; peritonitis, especially chronic; infiltration of colloid cancer in the omentum; a greatly dilated stomach; an ovarian tumour; distension of the uterus with fluid, or a pregnant uterus; an extremely distended bladder; a large hydatid tumour in connection with the liver or any other structure; an enormous cyst in the kidney; and a phantom tumour.

It is by *physical examination* that ascites is mainly distinguished from the conditions just enumerated, but it is important to observe that its ordinary signs may be modified or obscured by the co-existence of certain of these conditions; by the association of the dropsy with a tumour, morbid deposit, or enlarged organ; by the fluid being either very small in quantity, or on the other hand extremely abundant; by the mesentery being so short as not to allow the intestines to come forward; or by the existence of adhesions limiting the fluid. When ascites is associated with any solid enlargement, the latter may frequently be recognized by making sudden firm pressure with the fingers, by which the fluid is pushed aside and the firm mass reached; or in doubtful cases the fluid can be removed, and satisfactory examination then carried out.

Important aid in the diagnosis may also be derived from:—1. A careful *general history* of the case; and the conditions of the patient with respect to *age* and *general appearance*. 2. The *history of the enlargement*, as to whether it has been more or less acute or chronic in its progress, and whether it has fluctuated or steadily progressed; as well as its seat of origin, and directions of increase. 3. The accompanying *symptoms*; and the condition of the *main organs*, which should all be thoroughly examined. 4. The *results of treatment*, not forgetting the use of the aspirateur or trochar; of the catheter; and of means for clearing out the alimentary canal.

The characters of most of the enlargements mentioned above are described in other parts of this work, to which descriptions reference must be made for individual diagnosis. It is necessary, however, to point out specially the characters distinguishing *cystic tumour of the ovary* from *ascites*. 1. *Physical signs of ovarian tumour*. (i.) The umbilicus is often thinned and flattened out, but not everted or pouched out. (ii.) The enlargement is not so globular in shape; projects anteriorly; does not bulge in dependent parts; and is frequently not quite symmetrical, this being accurately determined by semi-circular measurements, or by comparing the distance from the umbilicus to the anterior superior iliac spine on each side. The greatest circumference is said to be about an inch below the umbilicus, in the recumbent posture; and the measurement from the ensiform cartilage to the umbilicus is generally shortened. (iii.) As a rule fluctuation is indistinct; the enlargement feels more or less firm and resistant, or even nodulated; while the sensations are not uniform over the entire surface. Frequently, on deep pressure greater resistance or tension is felt on one side than the other. (iv.) Percussion reveals dulness chiefly in front of the abdomen, even in the umbilical region, while the flanks are tympanitic, and the dulness often extends more towards one side than the other. The

prominence between the recti in the sitting posture is dull. There is usually a sense of considerable resistance on percussion. (v.) Auscultation may detect a pressure-murmur over one iliac artery. (vi.) Change of posture does not produce the alterations observed in ascites. (vii.) Examination per rectum detects a firm resistance. (viii.) The vagina is long and narrow above, the uterus being raised. (ix.) An exploratory trochar may bring away a thick, glutinous, or coloured fluid, which sometimes contains cholesterin; and after this has been removed, solid portions of the tumour may be felt more readily. 2. There is no history of any cause, or evidence of any organic disease likely to originate ascites. 3. Frequently the patient has observed that the enlargement commenced below, and from one side. 4. Symptoms which often accompany ascites are absent; while anasarca of the legs is commonly an early symptom of ovarian tumour, owing to pressure on the veins, which may be entirely or chiefly confined to one side.

With regard to the diagnosis of the *cause* of ascites, this can generally be made out by a satisfactory examination as regards the history, symptoms, and physical signs, directed to the liver, heart, and kidneys. The distinctive characters referable to the ascites itself have already been pointed out in the chapter on DROPSY. Obscure causes can only be determined by exclusion; and by a thorough consideration of all the circumstances bearing upon the individual case.

TREATMENT.—The measures adopted in the treatment of dropsy generally are applicable for cases of ascites, but the medicinal remedies which affect it most powerfully are *purgatives*, though these often fail. The balsam and resin of copaiba have been found decidedly efficacious in some instances. There are two measures, however, which demand special notice in connection with ascites, namely, *paracentesis* and the employment of *pressure*. It has been the custom to look upon paracentesis as an operation which should only be performed as a last resource, when the fluid has collected to such a degree as to cause urgent symptoms. When the ascites is a part of general dropsy from cardiac or renal disease, the amount of fluid is not often so great as to need its removal by operation, nor could this serve any beneficial purpose, except in affording temporary relief. The last remark applies also to many cases in which it is merely a local dropsy, as when ascites is associated with cancer of the liver; but there is one class of cases in which paracentesis may not uncommonly be performed as a curative measure, so far as the ascites is concerned, namely, when it is dependent upon *cirrhosis of the liver*. In such cases I have for some years had recourse to *repeated paracentesis* as a systematic method of treatment, the fluid being taken away again and again should it re-accumulate, and the results have been most satisfactory, due care being of course exercised in the performance of the operation, and in the subsequent management of the case. I have published some observations on this subject in the *Practitioner*, and since then other cases have been under my care, in which this treatment has proved highly successful. Other observers have also recorded favourable results from this operation, and therefore it appears to me justifiable to insist upon the employment of paracentesis abdominis as a means of cure, in connection with ascites from uncomplicated cirrhosis of the liver, should the fluid be at all

abundant, and show no signs of being removed by other methods of treatment. I am aware that cases have been recorded in which recovery has followed merely general tonic and other modes of treatment, but this is such a rare event that sole reliance cannot be placed on these remedies, though they aid materially the treatment by operation. This may also be assisted by *pressure*, the abdomen being tightly bound by a broad roller, as soon as all danger of undue irritation has ceased, from which much benefit often results. I may state that seldom has any injurious consequence followed the operation within my experience; and in some almost hopeless cases permanent recovery has been brought about. The employment of poultices of digitalis leaves, along with pressure, has appeared to me to do good in some instances.

CHAPTER XIV.

DISEASES OF THE STOMACH AND INTESTINES.

CLINICAL CHARACTERS.

Symptoms referable to the alimentary canal are of such common occurrence, that it has properly become a matter of routine in the examination of a patient to make enquiry concerning them. The succeeding general sketch will indicate the clinical phenomena which may be met with, and the course to be pursued in their investigation.

1. **Morbid sensations** are very commonly experienced over some part of the abdomen, the principal being pain or tenderness; heat or burning in the epigastrium; a sense of sinking, dragging, or tightness; discomfort, weight, and fulness after food, or, on the other hand, a feeling of emptiness even after a full meal, with constant craving for food: and abnormal movements within the abdomen. *Cardialgia* or *heart-burn* are terms applied to a peculiar sensation of heat or burning in the epigastrium, which extends upwards, as if along the œsophagus, to the throat; or which in some cases spreads more or less over the chest. With regard to *pain*, it is very important not only to investigate it carefully in all the usual particulars, but also in many cases to ascertain whether and in what way it is influenced by food or drink in general, or by special articles of diet; by vomiting or eructation; defæcation or the passage of flatus; posture or movement; coughing or deep inspiration; mental disturbance; or, in certain instances, by the periods of menstruation. In determining whether there is tenderness, it is well to take off the patient's attention, and its site and extent, degree, and apparent depth must be made out as accurately as possible, while it must be noted whether it appears to be connected with any evident morbid condition, such as a tumour. These remarks apply to all kinds of abdominal pain or tenderness. When the stomach is affected, uncomfortable or painful sensations are often referred to the back between the shoulders; or to the front of the chest.

2. The sensations as regards inclination for food and drink are often altered. *Appetite* may be deficient or lost—*anorexia*—in some

cases the feeling amounting to a complete disgust for food; excessive, both as to quantity and frequency—*bulimia*; attended with a desire or dislike for special articles; or altogether depraved. *Thirst* is a frequent symptom, and there may be a particular inclination for certain drinks; on the other hand, an antipathy to fluids is sometimes observed.

3. The process of **digestion** is frequently interfered with. Hence decomposition or fermentation is set up in the contents of the alimentary canal, leading to the production of gases; occasionally of alcohol; of various acids (lactic, butyric, acetic, &c.); or of vegetable growths (*sarcinæ ventriculi* and *torulæ*). Great discomfort may thus arise from flatulent distension; abdominal gurgling or rumbling—*borborygmi*; gaseous eructation; or acidity.

4. **Expulsive acts** are excited in connection with the stomach, with the view of getting rid of offending materials, viz., *vomiting* and *retching*, which may or may not be attended with a feeling of nausea; *regurgitation* of food; or *eructation* of gases, liquids, and other substances. With regard to the mechanism of these acts, *vomiting* is not only attended with contraction of the muscular coat of the stomach, but also of the abdominal and thoracic muscles, while the cardiac end of the œsophagus is relaxed. *Retching* is the same act, but ineffectual, merely air being expelled, either because the stomach is empty, or because the lower portion of the œsophagus is spasmodically closed. *Regurgitation* and *eructation* are simply due to contraction of the stomach, and some individuals can regurgitate their food at will. In infants the vomiting appears to be much of this character. A special form of eructation or regurgitation has been named *pyrosis* or *water-brash*, in which, often after painful sensations in the epigastrium, especially a sense of burning, a quantity of clear watery fluid rises into the mouth, generally tasteless and neutral, but in some cases sour or acrid and acid in reaction. This fluid has been supposed by some to be mainly saliva; others have considered it to be pancreatic juice; but probably most of it comes from the stomach.

5. Blood may be poured out into the alimentary canal, and either rejected from the stomach—*hæmatemesis*: or passed by the bowels—*melæna*.

6. The bowels are very commonly irregular in their action, either in the direction of **constipation** or **diarrhœa**. It is frequently desirable to make particular enquiry into this matter, as patients offer general statements which may easily mislead. The chief points to be ascertained are the frequency of the act of defæcation; whether attended by any straining; whether any unusual sensations precede, accompany, or follow it; and the quantity and characters of the materials discharged. In many cases it is imperative to make a personal examination of the stools, noticing their amount; colour; general appearance; consistence; the form and size of any solid fæces; odour; if there are any signs of fermentation or aëration; general composition, the materials to be specially looked for, in addition to ordinary fæces, being various articles of food, either unaltered or more or less digested; foreign bodies introduced from without; calculi, especially hepatic; intestinal worms or hydatids; blood or altered blood; mucus or pus;

fatty matter ; fibrinous flocculi or casts ; epithelial shreds ; vegetable, animal, or mineral poisons ; or, rarely, sloughs or portions of the intestines. Occasionally a chemical and microscopic examination of the *fæces* is necessary, especially for the detection of poisons and parasites, or even merely to determine their composition.

7. The **tongue** gives important information as to the state of the digestive organs, the particulars to be noted being :—*a.* Its size and shape, and whether it is marked by the teeth. *b.* The colour of its mucous covering, especially at the tip and edges. *c.* Its condition as to dryness or moistness. *d.* The state of the surface, whether smooth, glazed, fissured, furrowed, &c. *e.* The size, shape, and colour of the various papillæ. *f.* The presence, extent, and characters of any fur over the dorsum. It may be also mentioned here, that the mouth and throat are frequently affected when the stomach is out of order ; while a slimy or otherwise disagreeable taste is often experienced, and the breath has an unpleasant odour.

8. In some cases **abnormal sensations** are experienced about the lower part of the **rectum** and **anus**, such as pain, either constant, or only felt before, during, or after the act of defæcation ; fulness, weight, heat or burning, constriction, dragging, or frequent inclination to go to stool, with straining. Certain of these sensations are included under the term *tenesmus*. Hæmorrhoids are also of frequent occurrence.

9. The methods of **physical examination** applicable to the alimentary canal have been previously indicated, and these are particularly useful in making out flatulent distension ; a tumour in connection with the stomach or intestines ; accumulations in their interior ; permanent dilatation of the stomach ; and displacement, spasmodic contraction, or obstruction in the course of any part of the alimentary canal.

10. It will readily be understood that any derangement of the digestive organs is very likely to affect the **general system**. Hence numerous symptoms arise, varying much in their exact nature in different cases, the most important being wasting, often accompanied with a sallow or anæmic aspect ; a sense of debility, general discomfort, languor, malaise, and fatigue, with incapacity for effort, especially in the mornings and after meals ; more or less pyrexia, with a dry and harsh skin, or on the other hand a depression of temperature, with cold extremities and sweats ; nervous symptoms, viz., congestive or neuralgic headache, or a feeling of weight and oppression in the head, giddiness, irritability and petulance, depression of spirits and apathy, inaptitude for any mental effort, confusion of ideas and failure in intellectual vigour, hypochondriasis, wakefulness, or drowsiness with restless and unrefreshing sleep attended with disagreeable dreams, timidity and nervousness, pains in the limbs and back, chilliness or even rigors, especially in the evenings, creeping sensations over the body, or convulsions in children ; disturbance of the heart's action, in the way of palpitation or irregularity, feebleness, sometimes accompanied with faintness or actual syncope, as well as with uncomfortable sensations in the cardiac region, the pulse being weak ; dyspnoea, hiccup, or asthmatic attacks ; oppression across the chest, and cough ; changes in the urine, especially indicated by excess of lithates or sometimes of phosphates

or oxalates, excess or deficiency in acidity, and deficiency in chlorides; menstrual derangements; and skin-eruptions, such as urticaria, herpes, and psoriasis.

11. A tumour or solid accumulation in connection with the stomach or intestines may press on **neighbouring structures**, and may thus originate different symptoms.

CHAPTER XV.

ON CERTAIN GASTRIC SYMPTOMS AND FUNCTIONAL DISORDERS.

IN this chapter the chief symptoms and functional affections connected with the stomach will be considered; the diagnosis, prognosis, and treatment of the more chronic complaints will, however, be referred to in a subsequent general chapter on the subject.

I. GASTRODYNIA—GASTRALGIA.

ÆTIOLOGY.—These terms indicate a painful neuralgic affection of the stomach, chiefly met with among females, especially about the time of puberty, or when the menstrual functions are declining. The conditions with which the complaint is mainly associated are physical exhaustion and debility; anæmia; hysteria; hypochondriasis; nervous exhaustion from depressing emotions, anxiety, or excessive mental effort; gout or rheumatism; and uterine or ovarian derangements, including pregnancy. Sedentary habits, with habitual constipation; and excessive use of hot tea, have appeared to me to have had considerable influence in originating this affection in some cases. Occasionally it results from the action of malaria; and in rare instances depends on central nervous disease.

SYMPTOMS.—The prominent symptom of gastralgia is epigastric pain, varying much in its severity and characters, usually paroxysmal, and coming on either at regular or irregular intervals, though in many cases there is never complete relief. During the paroxysms the suffering may be extreme, especially in cases of hysteria or gout. Food frequently gives decided relief, the pain returning as the stomach becomes empty. Sometimes indigestible substances afford more ease than those which are digestible and soothing. Some patients, however, suffer intensely when they take anything, or after particular articles, such as hot tea. Pressure generally relieves, especially when made firmly and continuously, but there may be much superficial tenderness. Various curious sensations are often complained of in the epigastrium. During the severe attacks of pain, spasmodic movements of the stomach and bowels may be observed, with cramps of the abdominal muscles. Dyspeptic symptoms are habitually present in most cases, such as acid and gaseous eructations, flatulency, heart-burn, or pyrosis. The tongue

may be fairly natural. In hysterical cases chronic vomiting is sometimes a very distressing symptom; and not uncommonly a morbid craving exists for improper and indigestible articles of food. The bowels are generally very constipated. Frequently other nervous disturbances are observed. In some instances there is considerable emaciation, especially if food is not taken; but it is remarkable what a slight degree of wasting may attend the chronic vomiting of hysteria. Aortic pulsation is often present.

II. SPASM OR CRAMP OF THE STOMACH.

ÆTIOLOGY.—This differs from gastralgia in being an acute affection, attended with spasmodic contraction of the walls of the stomach, which may be excited by indigestible or irritating food or drink, or in some individuals by special articles of diet, ordinarily quite harmless; drinking excess of cold water, or indulging too freely in ices, especially when the stomach is empty; acrid secretions in the stomach; flatulent distension; mental emotion; and gout.

SYMPTOMS.—There is intense pain, which comes on suddenly in a series of paroxysms with remissions, being of a griping, constrictive, or twisting character. It is most marked near the pylorus, but may be felt running across the epigastrium, or even up along the œsophagus. Pressure gives marked relief, the patient either sitting up and making firm pressure over the stomach, lying upon the abdomen, or tossing and rolling about. Often a feeling of sickness is experienced, and the pain may be eased by vomiting. More or less prostration is frequently observed, and occasionally even severe collapse, with cold and clammy sweats, a very feeble and slow pulse, and fluttering of the heart, which condition may actually terminate in death. Sometimes the spasmodic movements of the stomach can be felt externally. If they continue for some time, a little soreness and tenderness remain, but these sensations soon pass off.

TREATMENT.—Should there be any irritating materials in the stomach, an *emetic* of sulphate of zinc or mustard, with plenty of lukewarm water, should be given immediately. A combination of spirits of ammonia, spirits of chloroform, and tincture of opium, with some carminative, will generally relieve the pain. If there is acidity, carbonate of soda or magnesia may be also administered. A little brandy or gin with hot water is often very beneficial. The continuous external application of dry heat over the abdomen, by means of hot plates or of bags containing hot bran or salt, is most soothing. After the attack it may be well to clear out the alimentary canal by means of a brisk *purgative*.

III. VOMITING—EMESIS.

ÆTIOLOGY.—The act of vomiting is excited either through some reflex irritation; or by a direct disturbance of the brain, affecting the stomach through the vagus nerves. Its numerous causes may be classed thus:—
1. *Those immediately acting upon the stomach, viz., irritating materials in its interior, whether introduced from without or formed there; organic*

diseases of its coats; obstruction at the pyloric orifice; external pressure upon the organ; or its displacement, *e.g.*, hernia of the stomach through the diaphragm. 2. *Reflex irritation from other sources*, particularly the throat; intestines (hernia, worms); peritoneum; female genital organs (especially in connection with pregnancy); and testicles. Reflex vomiting also accompanies the passage of a gall-stone or renal calculus, as well as other complaints attended with severe pain. It may arise in susceptible persons from any unpleasant smell, taste, or sight; or even from a sudden light. The vomiting which follows severe fits of coughing, especially in phthisis, comes mainly under this head. 3. *Centric or cerebral vomiting*. The chief causes coming within this group are injury to, or disease of the brain or its membranes, especially meningitis; cerebral anæmia or congestion; a poisoned state of the blood, the poison being either introduced from without (*e.g.*, alcohol and its products, tobacco, tartar-emetic, chloroform, opium and its constituents, lobelia), or being generated within the body, as in various febrile disorders, especially at the outset, uræmia, or from the inhalation of a hot and tainted atmosphere; mere nervous shock or fright; hysteria and other so-called functional nervous derangements, the vomiting being then probably the result of disordered circulation; and the imagination of unpleasant things. With regard to *sea-sickness* and other allied forms of vomiting, such as that brought on by swinging, these certainly come mainly within the *cerebral* class, but several theories have been proposed to explain the occurrence of this symptom under these circumstances. The peculiar movements, the appearance of objects in motion, and the unpleasant odours and sights usually present, probably all aid in inducing sea-sickness, though some authorities regard it as entirely due to a peculiar disturbance of the cerebral circulation. Vomiting is a prominent symptom in migraine or sick head-ache. Morning sickness is often associated with chronic alcoholism, being partly the result of the presence of deleterious materials in the blood; partly of catarrh of the throat and stomach, the former giving rise to fits of cough. It must not be forgotten that malingersers can sometimes excite vomiting at will.

CLINICAL CHARACTERS.—It is frequently requisite to make a thorough investigation with regard to vomiting, in order to arrive at a correct diagnosis as to its cause, the following particulars being noted:—1. The *times* and *frequency* of its occurrence. 2. The *circumstances* under which it takes place, whether spontaneously; only when the stomach is empty; after any food or drink, or only after certain articles or meals, it being important also to ascertain the quantity necessary to induce vomiting, and how soon it follows the introduction of the exciting materials; in connection with some obvious reflex or centric cause, such as cough, irritation in the throat, severe pain, a bad smell or taste, smoking, drinking, or mental disturbance; in certain positions, or on change of posture. It must not be forgotten that many poisons excite vomiting, and suspicious cases might come under observation needing complete and cautious investigation as to substances which had been taken into the stomach, or some of these might even be required for chemical examination. 3. The *sensations preceding and accompanying the act*, especially noting

if there is any feeling of nausea, as well as its degree ; giddiness ; prostration ; or pain. 4. The *manner in which the act is performed*, this being determined by personal inspection, if possible, especially remarking if it appears to be originated voluntarily ; and whether it is performed easily, or with more or less straining and retching. 5. The *after-effects*, particularly as regards the relief of gastric pain or its intensification ; and the influence upon cerebral symptoms. It may be mentioned here that the mere violence of vomiting may occasion serious lesions, such as rupture of the stomach or a vessel, apoplexy, or hernia, and it often leaves a sense of soreness over the abdomen. 6. *Examination of the vomited matters*. This is of the utmost importance, and ought never to be neglected, and the same remark applies to materials discharged by regurgitation or eructation, or brought up by the stomach-pump. The chief points to be noticed are :—*a*. The *quantity* rejected. *b*. The *taste*, as perceived by the patient. *c*. *Odour*. *d*. *General physical characters*, as to colour, and as to the materials of which the vomited matters consist, whether of different kinds of food, unaltered or in various stages of digestion, decomposition, or fermentation ; unusual substances introduced from without ; blood or altered blood ; gastric juice ; watery fluid ; mucus ; biliary matters ; fæces ; morbid products, such as calculi, worms, hydatids, portions of growths, or pus. It is also desirable to observe whether the vomit is frothy or yeasty-looking. *e*. *Chemical characters*. The reaction should always be taken ; and in certain cases it may be desirable to make a chemical analysis, in order to determine the presence of products of fermentation, gases, bile, sugar, urinary compounds, or inorganic or organic poisons. Of course in any case of suspected poisoning a complete analysis must be performed. *f*. *Microscopic characters*. The chief microscopic elements to be looked for in vomited matters are blood-corpuscles, pus-cells, cancer-cells, echinococci, and sarcinæ or torulæ. The microscope is also of use in detecting certain poisonous substances. *Sarcinæ* are vegetable growths, and appear as little oblong rectangular bodies, in shape resembling minute wool-packs, being divided into four equal parts by cross lines which correspond to dissepiments, these being again subdivided by fainter lines, so that in all they make up 64 divisions, each ultimate particle consisting of an elementary square cell. *Sarcinæ* are only found in acid vomit, which usually presents well-marked signs of having undergone fermentation, and they are most frequently observed in connection with pyloric obstruction.

DIAGNOSIS.—By attention to the particulars just considered, aided by the history of the case, and the other symptoms present, the cause of vomiting can generally be satisfactorily made out. It is requisite, however, to point out the chief distinctions between *cerebral* and *gastric* vomiting. 1. Nausea usually precedes and attends the latter ; but is often absent in the case of the former. 2. The accompanying symptoms in the one case point chiefly to the alimentary canal, and especially to the stomach ; in the other to the brain, head-symptoms being prominent. 3. The act of vomiting generally relieves any nausea, giddiness, or headache which may precede it, when it is gastric in origin ; such is not the case with cerebral vomiting.

TREATMENT.—Vomiting occurs under such a variety of circumstances, that little more can be done here than to indicate the general principles upon which its treatment should be conducted. 1. The *cause* must be sought out, and removed if possible. Thus an *emetic* is not uncommonly one of the best remedies, in order to clear out the stomach of irritant matters. Any reflex excitement must also be subdued. Patients should be told to aid voluntarily in suppressing vomiting as much as they can; being also warned against bringing it on by coughing or any such act. 2. Attention to *diet* is all-important. By withdrawing food altogether, or only giving very small quantities of cool or iced liquids, especially milk with lime-water or soda-water, or brandy with weak beef-tea or beef-juice, sickness may often be effectually stopped. It is particularly necessary to enquire into the feeding of children, as vomiting in these subjects is so commonly due merely to errors in this respect. 3. It may be useful to attend to certain *general matters*, such as position, rest, and free ventilation. Especially is this the case with regard to cerebral vomiting and sea-sickness, against which absolute rest in the horizontal posture, with a free supply of fresh air, may afford some protection. Pressure by means of a girdle across the abdomen has been recommended to prevent sea-sickness. 4. The chief *direct remedies* for the relief of vomiting are the sucking of small lumps of ice; effervescent draughts with hydrocyanic acid, or the latter with mucilage; iced champagne or brandy with soda-water; opium, either in the form of pill, as the tincture or liquor opii along with other remedies, or in an enema with starch; morphia in pill, by hypodermic injection, or sprinkled on a blistered surface over the epigastrium; chloroform; creosote in drop doses in the form of pill; sulphurous acid, sulphite of soda, or hyposulphites, should the vomiting depend on vegetable growths, or carbolic acid under the same circumstances; nux vomica or minute doses of strychnia, the last-mentioned proving wonderfully efficacious in some instances, after all other remedies have failed. Bismuth, magnesia, and carbonate of soda are also valuable under certain conditions. Dr. Ringer recommends in many forms of vomiting drop doses of vinum ipecac: every hour or three times a day according to circumstances; in others he finds arsenic useful. It is desirable to make all draughts as small and as agreeable to the taste as possible. 5. *External applications* over the epigastrium are sometimes beneficial, especially sinapisms, a small blister, cold by means of the ice-bag, and friction with chloroform or belladonna liniment.

IV. HÆMATEMESIS.

ÆTIOLOGY.—Blood may find its way into the stomach under a variety of circumstances. As a rule it comes from the vessels of this organ, being usually capillary in its origin, but sometimes due to the erosion of a large vessel; it may, however, be derived from other sources. The causes of hæmatemesis may be thus classified:—1. *Traumatic*, from external violence over the epigastrium. 2. *Diseased conditions of the blood*, especially in yellow fever. 3. *Vicarious*, particularly in connection with deficient menstruation. 4. *Injury* by foreign bodies or destructive chemical agents which have gained access into the stomach. 5. *Abnormal*

conditions affecting the stomach itself. Thus hæmorrhage may be the result of violent vomiting and retching; congestion from any cause; inflammation; ulceration; cancer; or rarely atheroma of the vessels, embolism or thrombosis, or varicose veins in the stomach. 6. *Diseases of other organs and structures*, especially those in the vicinity of the stomach. These chiefly act by inducing extreme mechanical congestion, which may follow any great obstruction of the portal circulation, but especially that due to cirrhosis of the liver, thrombosis of the portal vein or its branches, pressure upon the portal trunk or vena cava inferior, and long-continued cardiac or pulmonary affections. Acute atrophy of the liver is often attended with hæmatemesis, which is then partly due to the state of the blood. Splenic disease may originate this symptom in both ways. Sometimes a neighbouring disease, *e.g.*, cancer of the pancreas, destroys the coats of the stomach, and thus opens its vessels. Occasionally an abdominal or thoracic aneurism bursts into this organ. It is stated that an omental hernia may drag it downwards, and thus lacerate the mucous membrane. 7. It must not be forgotten that blood may be *swallowed*, coming either from the œsophagus, mouth, throat, nose, or respiratory organs. The blood of animals also is purposely swallowed sometimes, either by hysterical girls or by malingerers, being afterwards rejected.

SYMPTOMS.—Hæmorrhage into the stomach may not be attended with any external indications, either because the blood is poured out so abundantly as to kill instantly; or, on the other hand, because it is in very small quantity. In the majority of cases, but not always, there is either some obvious cause of the hæmorrhage; or it is preceded by symptoms referable to the stomach, or by signs of organic disease in its vicinity. Usually the blood is rejected, either by a mere act of regurgitation, or in most cases by more or less violent vomiting, though it must be remembered that this act may be the cause of the bleeding. The quantity of blood discharged necessarily varies much, and it is generally more or less mixed with food and other materials. Its characters are in the majority of cases very distinctive, it being non-aërated: brown or black in colour; grumous, often resembling "coffee-grounds," soot, or tar; and acid in reaction. Should the blood be coagulated, the clots are broken up, irregular, firm, and heavy. On microscopic examination the red corpuscles are seen to be much altered in shape or destroyed, and pigment granules are abundant. Most of these characters depend upon the action of the gastric juice on the blood. If the blood is discharged immediately or soon after its escape into the stomach, it may be quite bright and unaltered, or only slightly changed. Commonly some of it passes on into the bowels, giving rise to tarry stools. The general symptoms indicating loss of blood will of course be present in proportion to the extent of the hæmorrhage.

DIAGNOSIS.—The most important matter is to distinguish between *hæmatemesis* and *hæmoptysis*, which can usually be done by a consideration of the following points:—1. The *age of the patient*, hæmatemesis being more frequent later in life than hæmoptysis, except in the case of young women who are the subjects of perforating ulcer. 2. The *previous and existing symptoms*, as indicating some condition likely to give rise to one or other form of hæmorrhage; and also the symptoms imme-

diately premonitory to the attack, in the one case pointing generally to the stomach, in the other to the lungs. 3. The *mode of discharge of the blood*, whether by coughing or vomiting. It must be remembered, however, that vomiting may be excited by the cough in hæmoptysis; or some of the blood may be swallowed and afterwards rejected from the stomach. 4. The *characters of the blood*, as already described, with reference to colour, aëration, general aspect, reaction, and microscopic appearances. 5. In hæmoptysis some blood usually *continues to be discharged in the expectoration* for a certain time after the main bulk has been expelled; which is not the case in hæmatemesis. 6. Along with hæmatemesis altered blood is usually seen *in the stools*. 7. Careful *physical examination* will often reveal some organic cause likely to give rise either to pulmonary or gastric hæmorrhage; and, in connection with the former, there may be *râles* indicating the presence of blood in the bronchial tubes.

As regards the *cause* of hæmatemesis, this can only be made out by a thorough consideration of the case in all its details. Blood coming from above may be usually detected by local examination of the throat and nose. It is necessary to warn against mistaking the colour due to altered bile or iron for that of blood.

TREATMENT.—The principles of treatment in hæmatemesis are the same as for other hæmorrhages. In addition to bodily rest, the stomach must be kept in a state of absolute repose in severe cases, nutriment being administered only by enemata; in less dangerous cases very small quantities of cool or iced liquids being alone permitted. The patient should swallow small lumps of ice at frequent intervals. The most efficient medicines are gallic acid or acetate of lead in full doses, combined with opium; oil of turpentine; tincture of steel; or ergotine subcutaneously. Ice may be applied carefully over the epigastrium. It is very important to check any violent efforts at vomiting, by means of hydrocyanic acid with mucilage; morphia internally or by subcutaneous injection; or an enema containing tincture of opium; at the same time a sinapism being applied over the epigastrium. In cases of capillary hæmorrhage dependent on congestion of the stomach from portal obstruction, a saline purgative is useful, or an aperient enema. Should stimulants be required, they are best administered by enemata. Vicarious hæmorrhage must be treated according to ordinary principles.

V. DYSPEPSIA—INDIGESTION.

ÆTIOLOGY.—Difficulty and imperfection in the digestive process arise under a variety of circumstances, either in connection with the stomach, the intestines, or both; and affecting all articles of diet alike, or only special elements of food. In ordinary language, however, *dyspepsia* or *indigestion* signifies a group of symptoms depending upon interference with the *gastric* digestion, and this will at present be alone considered. In many instances it is merely due to *functional* disturbance of the stomach, or at all events no obvious organic disease can be detected, and it is to this class of cases that the terms are often limited;

the same symptoms, however, are commonly associated with different forms of *organic* mischief, and in the subsequent remarks on this subject it will be impossible to avoid alluding to these.

The causes of dyspepsia in general may be grouped under certain heads, according to the following arrangement:—

1. **Disorders connected with the diet**, namely, excessive eating; too rapid eating; insufficient mastication and ensalivation, this being especially associated with the habit of “bolting” food, or being due to absence or irregularity of teeth, particularly in old people; irregularity in meals, or their being taken too frequently or the reverse; and improper quality of food. The last may depend upon the nature of the food itself; the manner in which it is cooked; or upon its having undergone fermentation or decomposition. Liquids not uncommonly cause indigestion, and special mention must be made of the habit of drinking large quantities of cold water or other drinks with meals, by which the gastric juice is much diluted; of excessive indulgence in tea, or sometimes in coffee; and abuse of alcohol, particularly when spirits are taken at frequent intervals, strong or but little diluted. Injudicious use of sharp condiments with food sometimes originates dyspepsia. Idiosyncrasy causes some individuals to suffer after special articles of diet, which are usually easily digestible, such as milk or eggs.

2. **Alterations in the gastric juice.** This secretion may be in excess; deficient, even to complete suppression; or of morbid quality. The principal changes in quality are the presence of excess of acid; deficiency of acid, pepsine, or both; admixture with abundant mucus secreted by the stomach, which may even render the gastric juice alkaline; and the addition of abnormal ingredients. These alterations result from:—*a. Organic affections of the stomach*, especially mechanical congestion; inflammation; degeneration and atrophy of the secreting glands; degeneration of the vessels; ulceration; and cancer. *b. Morbid conditions of the blood*, as in renal disease, diabetes, pyrexial conditions, gout, anæmia. *c. General want of tone, with debility.* *d. Nervous disturbance.* Dr. Fothergill believes that dyspepsia not unfrequently has a reflex origin, in connection with ovarian irritation.

3. **Changes affecting the movements of the stomach.** The expulsive power of the stomach may be interfered with, in consequence of want of muscular or nervous tone, dilatation, or pyloric obstruction; or its movements are irregular; or the food passes out too soon, before it is properly digested, either in consequence of undue excitability of the stomach, or of imperfection in the pyloric valve.

It is by influencing the *secretory* and *motor functions* of the stomach that many of the ordinary causes aid in inducing dyspepsia, such as sedentary habits; undue exertion either just before or after a meal; habitual constipation; abuse of narcotics, tobacco, tea, or alcohol; excessive study, emotional disturbance, or any form of mental shock; and venereal excesses. Most important is it to bear in mind also that dyspeptic symptoms may be entirely due to disease of some other organ than the stomach; and in any case not yielding to proper treatment, the condition of the principal organs should be thoroughly ascertained.

SYMPTOMS.—In the first instance it will be well to give a general outline of the clinical phenomena which are, in different combinations,

observed in cases of dyspepsia; and then to indicate the special characters of the main varieties of the complaint.

Uncomfortable or painful sensations are experienced over the epigastrium, chiefly after meals, either due to the state of the stomach itself, or to its being irritated or distended by the materials formed as the result of the imperfect digestion. Not uncommonly these sensations are also complained of over the front of the chest, or between the shoulders. There is no tenderness as a rule. In the great majority of cases appetite is impaired or lost; some patients, however, have an inclination for food, but cannot take any, or they are obliged to confine themselves to certain articles of diet; while others, on account of the discomfort which is produced, are soon satisfied. Thirst is generally absent, but may be a prominent symptom. From the decomposition and fermentation of food result flatulent distension, with a sense of fulness and weight in the epigastrium; acidity; heart-burn; and eructations. It is very important to ascertain the characters of the eructations. They consist of gases, various liquids, and undigested food. The gases are either tasteless and odourless, resulting from fermentation; or they have some peculiar smell and taste, of which the chief are those resembling fish or rotten eggs, both being associated either with deficiency or arrest of secretion, and the last being directly due to decomposition of food, and the formation of hydric sulphide. The principal liquid eructations include the watery fluid of pyrosis; and matters having an acid, rancid, or bitter taste. Acid eructations indicate either that excess of gastric juice is formed; or more commonly that the contents of the stomach have undergone acid fermentation. Butyric acid imparts the rancid characters. Bitter eructations are probably due to the presence of bile. Nausea is felt in many cases, but vomiting is not a frequent symptom, though some patients endeavour to excite the act after taking food, in order to relieve their discomfort. The bowels are usually disturbed in their functions, as indicated by constipation, or in some instances by diarrhoea; colicky pains; flatulence and borborygmi; and the passage of foetid gas. The tongue, mouth, and throat are generally in an abnormal state, but they present different appearances in the different varieties of indigestion. The breath is also frequently offensive.

The *general* and other remote symptoms previously described as being associated with disorders of the alimentary canal, are present in variable combinations in dyspeptic cases.

VARIETIES.—The forms of dyspepsia which are usually recognized are as follows:—

I. Acute Dyspepsia.—This may come on in an individual habitually quite free from dyspeptic symptoms; or it may be merely an exacerbation of a previously existing morbid state. It is difficult to determine precisely what the morbid condition is in many cases of acute dyspepsia, but unquestionably in a good number of such cases there is gastric catarrh; while others are merely instances of *migraine* or so-called *sick-headache*. Some cases are, however, true examples of *simple dyspepsia*, arising either from some error in diet; or as the result of interference with the secretion of gastric juice, owing to nervous disturbance from emotion, over-exertion, or other causes.

The symptoms differ much in intensity and duration, but are liable to be particularly severe in children. They come on shortly after a meal, usually in about three or four hours, and are more or less of the following nature :—Uneasiness or pain in the epigastrium, with a feeling of heaviness and fulness, or sometimes cramp-like sensations, but no tenderness ; complete distaste for food ; thirst ; nausea, or vomiting of undigested food and other matters, such as mucus, acids, or bile, which affords relief ; eructations of gases, either tasteless and odourless or like rotten eggs, as well as of acids ; heart-burn ; a large and moist tongue, covered with a thick white or yellow fur, and sometimes presenting enlarged and red papillæ ; disagreeable taste and breath ; constipation usually, but occasionally diarrhoea with colicky pains. The *general* symptoms are usually very pronounced, and there is not uncommonly a sense of extreme illness and depression, with a certain degree of pyrexia, the skin being dry. Herpes about the face or general urticaria may break out. The urine is generally concentrated, and deposits lithates ; occasionally there is slight albuminuria. In infants there may be high fever or convulsions. Probably many of the cases of so-called *gastric remittent fever* in such subjects are merely examples of acute dyspepsia, attended with febrile symptoms assuming a remittent type.

TREATMENT.—The treatment of acute dyspepsia is similar to that of the slighter cases of gastric catarrh, which will be presently described. It is important to remove speedily all irritant matters, by means of *emetics* or *aperients*.

II. Chronic Dyspepsia.—1. *Atonic.*—Most of the ordinary cases of dyspepsia belong to this variety, being associated with general debility ; anæmia ; want of tone in the coats of the stomach ; or sometimes with degeneration of the peptic glands. The gastric juice is deficient, and muscular activity is impaired. The sensations in the epigastrium are mainly those of weight, fulness, and discomfort after food, without actual pain or tenderness, pressure often affording relief. Not uncommonly there is in the intervals a constant sense of sinking in the epigastrium. Occasionally œsophagismus is experienced. There is a disinclination for food, and also not unfrequently for drink. Digestion is much delayed, and a quantity of foul gas is formed, as well as acids and rancid matters, there being hence much flatulence, with various eructations. The tongue is large and marked with the teeth, pale, flabby, moist, and usually more or less furred, but it may be quite clean. The mouth and throat are also often pallid, flabby, and relaxed ; and the breath is generally disagreeable. As a rule there is habitual and obstinate constipation, the stools being firm, pale, deficient in bile, and offensive. The general symptoms are well-marked usually, the pulse being feeble, wanting in tone, and easily hurried ; the skin cool, soft, and clammy, with a tendency to coldness of the feet and hands : and the urine often abundant and watery. The nervous symptoms incline chiefly to languor, apathy, and indisposition for any effort. Oppression across the chest, shortness of breath, cough, and palpitation, are often complained of.

2. *Irritative.*—Probably in the form of dyspepsia thus named a condition of *chronic gastritis* is present to a greater or less degree.

Actual pain or a sense of burning is experienced in the epigastrium, increased by food, and generally accompanied with a little tenderness. Heart-burn and acidity are also common symptoms. Appetite is impaired, but thirst is usually felt, especially for cool drinks. Occasionally vomiting takes place, or it is excited in order to relieve symptoms; while nausea is often felt. Eructations are frequent, but are not foetid as a rule. The tongue tends to be contracted and red, especially at the tip and edges, with enlarged papillæ: it may either be furred or clean. The throat also is frequently in an irritable condition, being reddened and granular, or sometimes presenting follicular ulcers. Though constipation is the rule, from time to time diarrhœa with colicky pains is apt to set in. The skin tends to be hot and dry, the palms and soles having a burning sensation; and sometimes a cutaneous eruption breaks out. The pulse is frequent. The urine is often concentrated and deficient in quantity, depositing lithates on standing. The nervous disturbance is chiefly in the direction of irritability and petulance, with restlessness. There may be considerable emaciation.

3. *Nervous*.—A variety of dyspepsia has been described by this term, in which the prominent symptom is pain after food, supposed to be associated with hyper-secretion of gastric juice, and observed chiefly in young women. It seems to be merely a form of gastralgia; and may either exist alone, or associated with other kinds of dyspepsia.

4. One form of indigestion deserves special notice, which is by no means uncommonly met with, especially in out-patient hospital practice, in which there is an excellent appetite, and no particularly unpleasant sensations are felt after food, but almost as soon as this is taken it seems to pass out of the stomach, owing to this organ being in an irritable condition, or to incompetency of the pylorus; then rapidly traverses the intestines, giving rise to borborygmi and colicky pains; and is speedily followed by diarrhœa, the stools consisting chiefly of undigested food. Hence there is a constant craving for food, and a sense of considerable exhaustion or prostration is often experienced after the passage of a stool. In some instances this course of events only occurs the first thing in the morning; in others it follows every meal, and may thus cause serious loss of flesh. In some cases under my care the symptoms have been apparently due to the habit of excessive smoking; or to over-indulgence in hot tea.

TREATMENT.—This part of the subject will be discussed in the chapter on the treatment of chronic gastric affections.

CHAPTER XVI.

ACUTE GASTRIC CATARRH—ACUTE GASTRITIS.

ÆTIOLOGY.—*Exciting causes*.—1. The ordinary exciting cause of acute inflammation of the stomach is some *direct irritation* of its mucous surface, either mechanical or chemical, and set up by food or drink, foreign bodies, or poisons. Food may excite inflammation in any of

the ways mentioned under acute dyspepsia. Certain irritants require special notice, namely, very hot or cold substances; alcoholic liquids, either taken in excess or insufficiently diluted; sharp condiments; tartar emetic and arsenic. It must not be forgotten that the last two have been frequently administered for poisoning purposes, and arsenic may be inhaled from certain green and other papers used for papering rooms. 2. More or less gastric catarrh is commonly present in the course of various *diseases*, especially in many of the exanthemata, cholera, and yellow fever; and sometimes in diphtheria, pneumonia, puerperal fever, gout, acute rheumatism, and other febrile complaints. 3. The membrane lining the stomach may be affected, along with other mucous surfaces, as the result of *taking cold*. 4. Drinking a large quantity of *cold water while the body is heated* has been mentioned as a cause of gastric catarrh. 5. It has been stated that this affection occurs occasionally as an *epidemic*, attended with pyrexia. 6. Gastritis arises in connection with *starvation*, but is then probably originated indirectly.

As regards *predisposing causes*, it may be stated that children, elderly or feeble persons, and those who habitually suffer from a disordered stomach, are more liable than other individuals to attacks of gastritis from errors in diet and other slight causes.

ANATOMICAL CHARACTERS.—Hyperæmia of the membrane has been observed during life in cases of gastritis where a fistulous opening into the stomach existed, but it may completely disappear after death. The redness is punctiform or capillary, and usually in isolated patches; in cases of irritant poisoning, however, intense redness may be seen over the entire surface, though generally more marked on the top of the rugæ. Small extravasations are not uncommon. There is the usual cloudiness or opacity observed in mucous inflammations, with swelling and thickening of the membrane, and diminution in consistence. Superficial erosions or ulcerations and follicular ulcers are visible in many cases. In exceptional instances, when the inflammation is very intense, sloughs form, or suppuration is set up in the submucous tissue. Very rarely croupous or diphtheritic deposits have been observed. The secreting structures undergo important changes. The cells and nuclei of the tubuli become enlarged and multiply, while numerous granules and fat-globules form, so that the tubuli are distended. The solitary and lenticular glands are much increased in size. Gastric juice is not properly secreted, but the surface of the membrane is covered with a thick ropy mucus, alkaline in reaction, and containing a large number of young cells. Between the glands also there is a multiplication of cells, the lymphatic tissue being increased.

It will be readily understood that the appearances vary greatly according to the intensity and cause of the inflammation. When gastritis is the result of irritant poisoning, it often presents special characters, and deposits of the poisonous substance may be observed, or actual destruction of the coats of the stomach may take place. For a description of the appearances characteristic of the several poisons, reference must be made to toxicological works.

SYMPTOMS.—The symptoms attending inflammation of the stomach are usually *local* and *general*, but they present wide differences in their intensity and gravity in different cases. The morbid change may vary

from a slight superficial catarrh of the mucous lining to an extensive and violent inflammation, and the clinical phenomena present corresponding variations in degree.

Local.—Pain over the epigastrium is almost invariable, and may be very intense. In characters it is often hot and burning; or it shoots in different directions, especially towards the back. In some cases there is merely a sense of aching and soreness, or uneasiness and weight. These sensations are increased by food, by the act of coughing, or by a deep inspiration. They are often relieved by vomiting, but in some cases this act aggravates the suffering, especially if accompanied with violent retching. When the pain is very intense, there may be spasm of the abdominal muscles. Tenderness is always present, even when pain is not complained of spontaneously. Nausea, vomiting, and retching are prominent symptoms, anything that is swallowed being usually rejected at once. The vomited matters contain much mucus, saliva, often bile, and not uncommonly a little blood or "coffee-ground" material. There is complete anorexia, with urgent thirst, particularly for cool drinks. The tongue is frequently small, red, and irritable, especially at the tip and margins; or it may be furred in the centre, smooth, with a tendency to dryness; or large, moist, and covered with a white fur, the papillæ being enlarged. The mouth is slimy, and an unpleasant taste is experienced. Constipation or diarrhoea may be present, according to the state of the intestines. The lips are sometimes the seat of herpes.

General.—In some forms of gastritis premonitory symptoms are observed, such as chills or slight rigors, feverishness, and general malaise. During the attack pyrexia is frequently present, though seldom to a marked degree, except in children, with restlessness, headache, nervous depression, and sleeplessness. In severe cases, and especially when the inflammation is the result of poisoning, there is often great prostration and collapse, with a cold and clammy skin, pinched and anxious features, and a very rapid, weak, and small pulse. Hiccup is sometimes a most troublesome symptom, and the breathing may be much hurried.

DIAGNOSIS.—The symptoms above described, if present to any marked degree, are quite characteristic of gastritis; but in mild cases, or when mere gastric catarrh occurs as a complication of fevers, it may be difficult to diagnose this affection positively. The tongue often gives useful indications under these circumstances. When there is much pyrexia, constituting the so-called *gastric fever*, typhoid fever may be simulated at first. An important matter bearing upon the diagnosis of gastritis is the determination of its *cause* in any particular case. When the characteristic symptoms of this complaint are present in an intense degree, it must always be specially borne in mind that they may be due to the action of some irritant poison, either accidentally introduced into the stomach, or wilfully administered.

PROGNOSIS.—Generally this is favourable, except when the gastritis is the result of poisoning; or when it assumes a severe character, and attacks weak persons, very old or young individuals, or those suffering from acute febrile diseases. In some cases gastric catarrh tends to become chronic.

TREATMENT.—1. If there is anything in the stomach causing irritation, the first thing to be done is to get rid of this *exciting cause*, by means of an *emetic* of sulphate of zinc, mustard, or ipecacuanha, with plenty of lukewarm water; or by the stomach-pump, if necessary. A *purgative* at the outset is often useful, such as a dose of calomel, followed by a black draught, castor-oil, or a draught containing sulphate and carbonate of magnesia; in some cases an enema may be advantageously employed. It is decidedly objectionable to administer purgatives repeatedly, but, if necessary, an enema may be given from time to time.

2. The patient should be kept *quiet in bed*, and it is most important to allow the stomach to remain in a state of rest, either complete or partial according to the severity of the attack. In dangerous cases no food should be taken by the mouth, but nutrient enemata administered instead. If food is permitted, it must be entirely of a liquid character, or only thickened with some farinaceous substance, and given in small quantities at regular intervals. Milk diluted with lime-water or soda-water, or mixed with a little arrow-root or corn-flour, weak beef-tea, or mutton or chicken-broth, are the most suitable articles of diet. The patient must be prevented from drinking large quantities of water, which is usually much craved for, but may suck small lumps of ice at frequent intervals, and this gives much relief. As a rule *stimulants* are not required, but sometimes brandy in small doses, well-diluted, or mixed with soda-water, milk, or beef-tea, seems to be decidedly beneficial; or a little champagne with soda-water may be given. Should there be much prostration, considerable quantities of alcoholic stimulants may be called for, and if the stomach will not bear them, they must be administered by enema.

3. The prominent *symptoms* are most effectually alleviated by the administration of *antacids* and *sedatives*. Among the most serviceable remedies may be mentioned a combination of bismuth with hydrocyanic acid and opium; iced effervescent draughts containing carbonate of ammonia, potash, or soda, with hydrocyanic acid and tincture of cardamoms; solid opium, gr. $\frac{1}{2}$ –i, or, better still, morphia, gr. $\frac{1}{6}$ – $\frac{1}{4}$; hydrocyanic acid, ℞ iij–v, with a little mucilage; magnesia and the alkalies, alone or in combination with some of the other remedies. Either of these should be given at intervals of from two to four hours, according to circumstances, and it is desirable to make each dose of the medicine as small in quantity as possible. The alternation of *effervescent*s with an opium or morphia pill is frequently attended with the best results. In treating children of course due caution must be exercised in employing the powerful drugs mentioned above.

4. *Local treatment.*—In cases of severe gastritis it might be advisable to apply a few leeches to the epigastrium, but venesection is never required. The constant application of heat and moisture over the abdomen, by means of poultices, fomentations, or spongio-piline, is highly beneficial. Cold is employed by some practitioners. Sinapisms are sometimes of use, but more severe forms of counter-irritation are of doubtful efficacy. When gastritis arises from retrocedent gout, an attempt should be made to excite inflammation in the joints.

5. Much care is needed during *convalescence*, as regards diet, hygienic

management, and medicinal treatment. Various remedies employed in the more chronic complaints, which will be hereafter considered, are of much service if given with due precautions, such as the vegetable bitters, alkalies, acids, pepsine, and preparations of iron. The state of the bowels must be attended to, and mild purgatives administered if required. Vichy and Seltzer waters are often beneficial, when taken in moderation.

CHAPTER XVII.

CHRONIC DISEASES OF THE STOMACH.

I. CHRONIC GASTRITIS—CHRONIC GASTRIC CATARRH.

ÆTIOLOGY.—In its more or less chronic form gastric catarrh is met with:—1. Occasionally as the *sequel of an acute attack*. 2. As the result of *constant or repeated irritation of the stomach*, particularly by indigestible food, tea, alcohol, purgatives, stimulant and bitter medicines, hot condiments, and arsenic. 3. In connection with *chronic organic diseases of the stomach*, especially cancer, ulceration, and albuminoid disease. 4. From *interference with the portal circulation*, which leads to persistent mechanical congestion of the stomach. 5. Associated with *constitutional disorders*, particularly phthisis, renal disease, gout, syphilis, or any low general condition of the system.

ANATOMICAL CHARACTERS.—The colour of the mucous lining is changed, there being increased vascularity, and the vessels may be permanently distended; frequently, especially if there has been mechanical congestion as well, portions of the surface are seen to be grey, slate-coloured, or almost black, from altered blood-pigment. Small hæmorrhagic erosions are not uncommon. The surface is often covered with a thick tenacious mucus. One of the most important changes is a thickening of the membrane, accompanied with increased firmness and toughness, sometimes so marked that it has a leathery feel, although there may be at the same time slight superficial softening. More or less opacity is also observed, some spots appearing quite opaque and white from fatty degeneration. Mammillation is a common appearance in the vicinity of the pylorus. The intimate changes which occur have been described by Wilson Fox, Fenwick, Handfield Jones, and other observers, as an increase in the interstitial tissue, including the lymphatic elements; distension of the solitary glands; alterations in the gland-structures here and there, in the way of fatty degeneration and destruction of their epithelium, thickening of their membrane, contraction and puckering, formation of minute cysts, or atrophy; and sometimes fatty degeneration of the entire membrane in spots, including the small vessels. The mammillation may be due to the enlarged glands; or to contraction of the muscular fibres which surround them.

SYMPTOMS.—The symptoms referable to the *alimentary canal* which are most characteristic of chronic gastritis are considerable uneasiness over the stomach, amounting in some cases to actual pain, though this is never severe, generally increased soon after meals, especially after

taking hot or spiced articles ; a certain degree of tenderness ; a sense of heat and burning, sometimes extending over the chest ; frequent heartburn, with acidity, and acid or gaseous eructations ; impaired appetite, the patient being soon satisfied, though there may be a feeling of emptiness and longing for food ; thirst, especially for cool drinks, often particularly marked between meals and in the evenings ; a small, bright-red, raw-looking, and sore tongue, with enlarged and red papillæ, or the last condition alone, there being usually more or less fur as well, though in some cases the tongue seems abnormally clean ; an irritable or catarrhal condition of the lips, mouth, and throat, sometimes accompanied with aphthæ or follicular ulceration ; hot and disagreeable breath ; intestinal disturbances, in the way either of constipation with pale and dry stools, or of diarrhœa with lenteric stools, as well as flatulence, and colicky pains. There is often a feeling of sickness, but actual vomiting is only common in certain forms of gastric catarrh, viz., when it is associated with chronic alcoholism, renal disease, or portal congestion, sickness being then frequently a prominent symptom in the mornings and after meals. In some cases a large amount of alkaline mucus is brought up, when the affection is termed *gastrorrhœa*.

The *general system* suffers more or less as a rule, there being the various nervous and reflex symptoms previously described, often accompanied with loss of flesh and debility ; sallowness or slight jaundice ; a little pyrexia, especially in the evenings and after food or stimulants, accompanied with a dry and harsh skin, a sense of burning in the palms and soles, and flushing of the face. The urine is frequently disordered, depositing urates abundantly, or in some cases phosphates or oxalates. Cutaneous eruptions are not uncommon. Sometimes signs of premature decay are evident.

II. ULCER OF THE STOMACH.

Some writers describe all ulcerations of the stomach under one group ; but it is better to distinguish two chief forms, viz., (a) the *perforating ulcer*, characterized by its tendency to perforation ; and (b) the *chronic ulcer*, which is attended with much thickening of tissues. There are other varieties of less importance.

ÆTIOLOGY.—On the whole females are more subject to gastric ulcer than males. It is most common between 18 and 25 or 30 years of age ; and in advanced life. The *perforating ulcer* is most frequent in *young females* ; the *chronic* in *old males*. Among the causes to which gastric ulceration has been mainly attributed are intemperance, bad living, mental anxiety, tuberculosis, various lowering diseases, disorders of menstruation, suppression of hæmorrhoidal flux, pregnancy, and the rapid healing of cutaneous ulcers. Much doubt exists, however, on this matter, and often the morbid condition cannot be traced to any definite cause.

With respect to the *pathological cause* of the disease, gastric ulcer is considered by most authorities to originate in an interference with the supply of blood to a portion of the mucous membrane of the stomach, the vitality of which becomes thus impaired, so that it is

acted upon by the gastric juice and destroyed, the deeper tissues being subsequently attacked in the same way. This imperfect vascular supply may result from extensive extravasation into the tissues of the stomach; embolism; degeneration or narrowing of the arteries; or, rarely, submucous suppuration. Some pathologists regard ulceration in the stomach as being invariably the consequence of inflammation.

ANATOMICAL CHARACTERS.—The *perforating ulcer*, or, according to some authorities, the *early stage of ulceration*, may be seen in various stages of destruction of the coats of the stomach, beginning with the mucous membrane and extending towards the peritoneum. Its edges are even and clean-cut, as if punched out, without any thickening, and as each subsequent coat is destroyed over a smaller area than that above it, the ulcer has a somewhat conical shape, the apex being next the peritoneum, and the margin of each layer being well-defined. The floor is smooth, but may be sloughy or covered with extravasated blood.

After the *chronic ulcer* has existed for some time, its margins and floor become greatly thickened and indurated, owing to the formation of a nucleated and granular substance, which subsequently develops into imperfect fibrous tissue. The different layers become matted together over a variable extent, but the ulcer remains distinctly conical or funnel-shaped, the mucous membrane being inverted. Granulations are sometimes seen on its surface. It is important to notice that in this condition of the ulcer firm adhesions tend to form between the stomach and neighbouring organs, by which the evils of perforation are prevented.

The superficial form of gastric ulcer is usually circular or oval at first, but it may become irregular, either from extension or from the coalescence of two or more ulcers. The size generally varies from $\frac{1}{4}$ inch to 1 or $1\frac{1}{2}$ inches in diameter, but it may reach as much as 5 or 6 inches in length. Usually there is only one ulcer, but two or more are sometimes found, or cicatrices of former ulcers may be observed. The most frequent seats of ulceration are the posterior surface, the neighbourhood of the smaller curvature, and the vicinity of the pylorus; it is rare on the anterior surface, near the greater curvature, or at the cardiac end. Chronic ulcer is most frequent near the pylorus.

The mucous membrane around the ulcer may be quite healthy; or it presents signs of hæmorrhage and extravasation, polypoid vegetations, or acute or chronic catarrh.

Cicatrizization frequently occurs, generally by granulation, and the cicatrix may be either smooth or puckered, or it may give rise to much thickening, contraction, and alteration in the form of the stomach, in some instances leading to stricture, especially at the pyloric end, or causing the organ to assume various distorted shapes. Sometimes an ulcer does not completely cicatrize; or it heals at one spot, while it extends to another.

Perforation is very liable to happen if there is no thickening or adhesion, especially when the ulcer is so situated that it is subject to much disturbance by movement and distension of the stomach, or where adhesions cannot easily form, as in the anterior wall or near the smaller curvature. When perforation takes place, the peritoneum forms

a small slough, and then gives way by a small sharply-defined or slightly torn opening. If adhesions have formed, the coats may be destroyed completely without any immediate harm resulting, and ultimately even considerable portions of contiguous organs. In some cases the thickened peritoneum is distended in the form of a pouch.

SYMPTOMS.—Occasionally gastric ulcer is unattended with any characteristic symptoms, and its existence is only revealed by some serious event, such as perforation, or the opening of a large vessel. In many instances the clinical phenomena are for a time but ill-defined and obscure, especially in the chronic form of ulceration. The symptoms which are suggestive of ulcer may be thus summarized:—1. Severe localized pain in the epigastrium, of aching, gnawing, or burning character, or attended with a feeling of sickness and prostration; persistent, but increased after food, especially after certain articles, such as hot tea. 2. Local tenderness on pressure. 3. Vomiting, particularly after taking any food or drink, this act not being attended with much nausea or retching as a rule, and generally affording relief to the pain: while the vomited matter sometimes contains *sarcina ventriculi*, or fragments of the stomach-tissues. 4. Hæmatemesis, either due to capillary rupture or to the opening of a large vessel, and generally followed by melaena. 5. Various dyspeptic symptoms, such as flatulence, eructations, pyrosis, deranged appetite, and constipation or occasional diarrhoea. 6. More or less general wasting and debility, which may be accompanied with a dull, earthy, cachectic aspect, or in young females with a marked anæmic or chlorotic tint; the menstrual functions being also usually much disturbed in these subjects.

There are some points of importance which require comment. The exact site of the pain will vary with that of the ulcer, but it is most commonly felt a little to the right of the epigastrium; if the ulcer is on the posterior surface, the pain may be referred to the back, or one side of the spine. Movement and posture often influence the degree of suffering, and it is frequently aggravated by mental emotion, or in females during the menstrual periods. In the chronic form pressure not uncommonly gives marked relief, and hence some patients voluntarily press against the epigastrium. Occasionally food also gives ease, instead of increasing the pain. Vomiting is chiefly observed when an orifice or its vicinity is affected, especially the pyloric. The interval which elapses between the taking of food and the subsequent occurrence of sickness or aggravation of suffering will often indicate the situation of the ulcer: thus, if it is near the cardiac opening these effects are produced immediately; if about the pylorus, they only follow after some time. In some instances the pyloric orifice is permanently obstructed, and the stomach becomes consequently dilated, the signs of which will be presently indicated. No distinct tumour can ever be felt, but occasionally, when there is much thickening and induration about the pylorus, this can be made out by careful manipulation. The tongue is often abnormal, but has no special characters. Salivation is said to occur sometimes, the saliva being deficient in sulpho-cyanides.

The character and severity of the *general* symptoms will depend mainly on the intensity of the pain; the degree of interference with digestion and nutrition; and the amount and frequency of hæmor-

rhage. In exceptional instances of perforating ulcer pyrexia has been noticed.

The *course* and *duration* of cases of gastric ulcer are very variable. As a rule they are of a chronic nature, but occasionally the perforating variety appears to be rather acute in its progress. Many cases terminate in cicatrization and recovery; but death is also not an uncommon event, taking place either suddenly or rapidly from perforation or hæmorrhage, or gradually from asthenia.

III. CANCER OF THE STOMACH.

ÆTIOLOGY.—Among *general predisposing causes* of gastric cancer age is the most important. The majority of cases occur between 50 and 60, but the complaint may be met with from 30 to 70, and, exceptionally, even beyond these extremes. The male sex; hereditary tendency; a high social position; and mental anxiety are also believed to predispose to gastric cancer. As *local causes* leading to the development of the disease have been mentioned long-continued pressure over the epigastrium; injury; and the repeated action of irritants upon the stomach, such as hot spices or strong spirits.

ANATOMICAL CHARACTERS.—All forms of cancer are met with in the stomach, but *scirrhus* is by far the most common. It is in this organ, however, that the *colloid* variety is usually observed. The pyloric, orifice and its vicinity is the part of the stomach generally involved, but the cardiac end, curvatures, fundus, or body may be attacked. The cancer may be very limited in extent, especially *scirrhus*; or widely-spread, implicating a great portion of the walls, which is especially the case with *colloid*, and when the body of the stomach is implicated. In some cases it passes from the stomach to the œsophagus, but shows no tendency to invade the duodenum. The submucous tissue is usually the primary seat of the deposit, and it subsequently involves the deeper coats, as well as the mucous membrane partially. *Colloid*, however, according to Dr. Wilson Fox, seems to begin in the glandular structures. In most cases the morbid growth infiltrates the coats, but encephaloid cancer is prone to form nodular masses in the submucous tissue.

The actual characters of the cancerous part will necessarily vary with the nature and amount of deposit. In most instances it will be found hard, dense, thickened, contracted, and whitish on section; but each variety presents its own peculiar characters. Not unfrequently the mucous membrane becomes destroyed, and an ulcer forms, but there may be extensive cancer without any ulceration. The ulcer has thick ragged margins, and an uneven floor, which presents cancerous masses. Adhesions often form with other organs, which may become involved by extension; or occasionally perforation takes place into hollow viscera or other parts.

The seat of the cancer influences materially the shape and size of the stomach, and the condition of its walls. When the disease involves the pylorus, the organ becomes much dilated, and its walls are hypertrophied.

On the other hand it is contracted, shrunk, and small when the cardiac orifice is affected. If the middle of the body of the stomach is alone implicated, the cavity is greatly constricted at this part, so that the organ assumes an hour-glass form. Cancer along the curvatures distorts the stomach in various ways by its contraction, often drawing the orifices near together. In some instances the organ is displaced considerably, owing to a mass at the pyloric end having fallen in the abdominal cavity by its own weight, and subsequently become adherent in some abnormal position. Such a mass may press on various structures, and thus lead to other morbid conditions, for instance, on the portal vein, causing ascites.

Acute or chronic gastritis and glandular degeneration are generally observed, to a greater or less extent, associated with gastric cancer.

Cancer of the stomach is almost always *primary*, but it tends to involve other abdominal organs and structures, either by extension or by originating secondary deposits, the latter being particularly common in the liver.

SYMPTOMS.—For some time, and in some cases even to the last, the symptoms of gastric cancer are merely those of dyspepsia, with wasting; or the disease may be entirely latent. As a rule, however, there are prominent *local* and *general* symptoms.

Local.—Pain is generally present in some part of the epigastrium, varying with the seat of the cancer, and though at first amounting merely to a sense of weight and uneasiness, it usually becomes very intense. It may be continuous or intermittent, and is often paroxysmally increased. Food aggravates the pain as a rule, but not so distinctly as in cases of gastric ulcer, and it may even be relieved by food. In character it is frequently described as aching, burning, or gnawing, as well as lancinating, shooting towards the hypochondria, back, or shoulders.

Tenderness is almost invariable, with a feeling of soreness, even when there is no spontaneous pain, the slightest touch being sometimes unbearable. This may be associated with some evident tumour or thickening.

Nausea and vomiting are rarely altogether absent, usually becoming more frequent and distressing as the case progresses. Vomiting is particularly observed if the orifices are involved, or if there is ulceration, and the time of its occurrence with reference to food varies according to the seat of the cancer, in the same manner as has been described when speaking of ulceration. The rejected matters not uncommonly contain numerous *sarcinæ ventriculi* and *torulæ*, as well as occasionally cancerous elements; when there is ulceration they may be very offensive.

Hæmatemesis is a very frequent and early symptom, but usually to a small amount. Large hæmorrhages are stated only to occur in the later stages, and not to be so common as in connection with ulcer, but the former statement is certainly not always true, according to my experience. Melæna is often observed at the same time, or even independently of hæmatemesis.

Appetite varies, and the tongue has no constant characters. Among other frequent symptoms must be mentioned flatulence; gaseous eruc-

tations, at first odourless, afterwards often foetid; acidity; gastrorrhoea; obstinate constipation; and hiccup.

Physical examination may reveal one or more of the following conditions, and it should in all suspected cases be carefully and repeatedly made, especially when the stomach is empty:—1. A sensation of *fulness and resistance over the epigastrium*, perhaps not uniform, detected by manipulation and percussion, the sound produced by the latter being somewhat dull and muffled. This indicates extensive infiltration of the walls. 2. A *distinct tumour*, especially in connection with scirrhus of the pylorus. Its site is usually the right hypochondrium or epigastrium, but it may be felt in the iliac fossa owing to displacement of the stomach, or in females near the umbilicus. The tumour is small, circumscribed, dense, hard, and irregular. Not usually movable on manipulation, it sometimes alters its position with change of posture, and with varying degrees of distension of the stomach. There is dulness on percussion over the tumour, which may, however, be modified by the stomach-sound. Aortic pulsation may be transmitted through it. It is said that a cancerous tumour of the stomach may disappear completely by sloughing or ulceration. 3. *Dilatation of the stomach*, due to pyloric obstruction. 4. *Retraction of the abdomen*, which may even assume a concave form, and when this condition is present, a tumour can be more easily detected, and may even be visible. 5. On the other hand, in exceptional instances a pyloric tumour presses on the portal vein, and thus causes *ascites*.

General.—The constitutional symptoms are as a rule very pronounced, namely, early and rapidly-progressing emaciation and debility, ultimately often becoming extreme; signs of the cancerous cachexia, the skin being dry and harsh, with a dirty, sallow, or earthy hue, and the features sunken and pinched; marked anæmia, especially if much blood has been lost, with a tendency to œdema of the legs, or sometimes to thrombosis; great weakness of the heart and pulse; lowness of spirits, with a melancholic and anxious expression, or irritability and moroseness; and disturbed sleep. Occasionally jaundice is observed, owing to pressure on the common bile-duct. In the later stages the temperature is now and then a little elevated, but pyrexia is absent as a rule.

The *course and duration* of gastric cancer are subject to some variations. Generally the progress is continuous and rapid; sometimes there are slight or even marked remissions in the symptoms, but these seldom last for any length of time. Cases rarely extend beyond two years from the first appearance of symptoms; and the average duration is said to be a little over a year.

IV. PYLORIC OBSTRUCTION—DILATATION OF THE STOMACH— PYLORIC INCOMPETENCE.

Ætiology.—The pylorus may be obstructed either from some morbid condition of the stomach itself, inducing stricture or stenosis; or from external pressure. The following list includes the main causes:—1. *Cancer of the pylorus*, especially scirrhus, which is by far the most frequent cause. 2. *Cicatriziation of an ulcer*. 3. *Corrosive poisoning*

and its results. 4. *Hypertrophy of the coats*, with thickening of the submucous tissue. 5. *Spasmodic contraction* of the muscular coat, due to an ulcer in the vicinity. 6. *External pressure* from—*a*, tumour of the pancreas; *b*, cancerous masses projecting from the liver; *c*, enlarged glands in the vicinity; *d*, very rarely a tumour connected with the gall-bladder.

Pyloric obstruction causes the stomach to become dilated, while its walls hypertrophy, especially the muscular coat, in the endeavour to overcome the interference with the passage of the food, the intestines at the same time being contracted.

Dilatation of the stomach may also result from obstruction of the duodenum; or, rarely, of the upper part of the jejunum. A certain degree of distension is due sometimes to deficient tone of the muscular coat of the organ, from weakness or want of proper innervation. As exceptional causes should be mentioned local paralysis near the pylorus, interfering with the expulsion of food; hernia of the stomach through the diaphragm, or its displacement by an omental hernia; and accumulations of foreign substances in its interior, such as hair. Dilatation of the stomach has been attributed to the presence of *sarcinæ*, but this is extremely doubtful.

Probably a condition of pyloric incompetence is sometimes present, in consequence of which the food passes too readily out of the stomach, either immediately or before it is properly digested. This incompetence may be due to destruction of the tissues about the pylorus by malignant disease or ulceration; or to paralysis of the sphincter.

SYMPTOMS.—In cases of pyloric obstruction there may be evidences of some organic disease of the stomach about the pylorus, or of some morbid condition in its vicinity causing pressure; but the only positive clinical indications of this condition are derived from the *characters of the vomiting*, and of the *matters rejected*; accompanied with the physical signs of a *dilated stomach*. The vomiting comes on some hours after food, or may only occur at intervals of a few days, a great quantity being then discharged. The vomit never contains bile, but is strongly acid, presents numerous *sarcinæ* and *torulæ*, and readily ferments. The stomach may be more or less enlarged, occasionally so much so as to cause general distension of the abdomen. The *physical signs* of this enlargement are as follows:—(i.) The *shape of the stomach* may be retained and made out by careful examination; while movements of the organ can sometimes be felt or excited by the hand. (ii.) On *succussion* a splashing sensation is often experienced, when the stomach contains liquids. (iii.) *Percussion* reveals extension of the stomach-note upwards, as well as downwards, if the organ is empty. If it contains food or fluid, however, there is dulness below, as after taking a good draught of water; and this dulness may be made to alter its position by changing the posture of the patient. (iv.) If a *probang* is passed by the œsophagus, it may reach the bottom of the stomach, and be then felt through the abdominal walls. (v.) Emptying the stomach by means of the *stomach-pump* may afford some aid. (vi.) *Auscultation* may reveal a splashing sound on succussion; the sound of food or liquids falling into the stomach when swallowed; or loud heart-sounds reverberating through the space. (vii.) The heart may be displaced

upwards. Occasionally the patient experiences a sensation as if the food passed too low down in the abdomen.

Pyloric incompetence leads to digestive disorders in the intestinal canal, often accompanied with diarrhoea, undigested food being passed in the stools; while the general nutrition is liable to become much impaired. It is for the detection of this condition that the plan already mentioned, of giving substances to cause effervescence and the formation of gas in the stomach, is resorted to.

CHAPTER XVIII.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT OF CHRONIC GASTRIC AFFECTIONS.

I. DIAGNOSIS.

It will be most convenient to consider the diagnosis of stomach disorders according to certain groups in which they are presented in ordinary practice.

1. Many cases come under observation evidently belonging to the class of **dyspeptics**. It is then requisite to determine what form of dyspepsia is present; and to what causes this is due. The two chief varieties to be distinguished from a clinical point of view are the *atonic* and *irritative*, which are mainly separated from each other by the difference in the intensity and characters of the sensations in the epigastrium; the conditions of the tongue, mouth, and throat; the absence of thirst in the atonic form; the minor degree of general disturbance in the same variety, this being also of a different nature. Further, diarrhoea is often present in the irritative form; while in atonic dyspepsia constipation is generally a prominent symptom. With regard to the *causes* of any dyspeptic symptoms, these must be ascertained by a satisfactory enquiry into the habits of the patient; and a thorough investigation as to the condition of the various organs, as well as of the general system. It is particularly necessary to recollect that such symptoms may depend upon a state of gastric catarrh kept up by portal congestion, or upon some disease affecting the constitution, especially Bright's disease; or that they may mark the early stage of some serious organic affection of the stomach. In order to see what elements of food are not properly digested, it has been proposed to evacuate some of the contents of the stomach at certain intervals by the aid of the stomach-pump, and thus to obtain them for personal examination.

2. It is frequently difficult to diagnose between mere **functional dyspepsia** and the less serious **organic affections**, namely, glandular degeneration, and chronic gastric catarrh or gastritis. The opinion has been already expressed that many cases of so called irritative dyspepsia are merely those of chronic gastritis, and it is scarcely practicable to draw a line between them.

3. Young women not unfrequently complain of *severe gastric pain*, in whom it is difficult to determine with certainty whether they are suffer-

ing from mere **gastralgia** or **nervous dyspepsia**, or from **perforating ulcer**. In any really doubtful case it is safer to diagnose the latter affection. The chief distinctions are that in gastric ulcer the pain is usually more localized, and is almost always much increased by food; there is a sense of soreness and deep tenderness, but often less superficial tenderness than in the other affections; vomiting occurs after food, usually affording relief, and there may be hæmatemesis; emaciation is generally well-marked; while there are none of the neuralgic pains in other parts, or signs of hysteria, so commonly associated with gastralgia and nervous dyspepsia.

4. In persons advanced in years more especially, but occasionally in younger individuals, symptoms are not uncommonly present which render the diagnosis between mere **functional disorder** and **grave organic disease** of the stomach—either *chronic ulcer* or *cancer*—for a time very doubtful. Persistent disturbance of digestion without any evident cause, and not yielding to proper treatment, should lead to the suspicion of the existence of serious organic disease, though it must be remembered that the symptoms may be due to glandular degeneration. The diagnosis would be rendered more positive by the presence of marked pain in the stomach, increased by food; localized tenderness; vomiting; hæmatemesis; and progressive emaciation. Some of these symptoms, however, especially pain, I have known to be very intense in connection with mere functional disorder in females and gouty subjects. With regard to hæmorrhage, it is important to observe that the blood, if in small quantity, is sometimes not vomited, but passed entirely by the stools, and therefore in any doubtful case it is desirable to examine the fæces.

5. The diagnosis of **chronic ulcer** from **cancer** is frequently very difficult at first. The circumstances in favour of the latter are:—the patient being a male and advanced in years; a hereditary history of cancer; pain more constant, and less influenced by food and vomiting; hæmorrhage not occurring in the earlier stages, but late in the case, and being on a small scale; marked and early digestive disturbances, appetite being much impaired; considerable and rapid wasting, especially if independent of vomiting or loss of blood; and evidences of the cancerous cachexia. Later on, the discovery of a tumour, especially near the pylorus; signs of obstruction of the pyloric orifice, with dilatation of the stomach; inefficiency of treatment; the almost continuous and speedy progress of the case; and perhaps signs of cancer in other parts, usually serve to render the diagnosis certain. It is necessary to guard against mistaking a contracted rectus abdominis for a tumour.

With regard to the *part of the stomach* involved, this can often be made out by noting the exact seat of the pain and tenderness; the relation of pain and vomiting to food and posture; the state of the stomach, as to whether the organ is contracted or dilated; and the locality of any physical signs which may be discovered.

6. Affections of the stomach may simulate **neighbouring diseases**, or *vice versâ*, especially disease of the duodenum or head of the pancreas; cancer in the small or large omentum; hepatic affections; the passage of a gall-stone; disease of the absorbent glands in the

vicinity; affections of the transverse colon; and painful conditions of the abdominal walls. In any doubtful case a correct diagnosis can only be arrived at by a careful consideration of all its details.

7. Occasionally **rare conditions** in connection with the stomach give rise to much difficulty in explaining symptoms associated with this organ. Of such which have come under my own notice I may mention abscess in the walls of the stomach; and a hernial protrusion of this organ through the diaphragm. On the other hand, it must be remembered that extensive organic disease may exist, even cancer involving a considerable portion of the gastric walls, without any or with only slight local symptoms, there being merely profound interference with the general nutrition.

II. PROGNOSIS.

1. The prognosis in any case of **dyspepsia** will depend mainly on the time the symptoms have lasted; their causes, and whether these can be removed; and the ability and willingness on the part of the patient to submit to appropriate treatment. When indigestion has become a chronic and habitual condition, the complaint is frequently very difficult to cure, especially if it is associated with permanent organic changes in the coats and glands of the stomach, with conditions keeping up venous congestion, or with some general disease; or if the patient persists in injurious habits. Most cases may, however, be restored to health if properly attended to, or at all events they may be much improved. If there is reason to believe that the mucous coat of the stomach, with its glands, has undergone serious morbid changes, especially after the abuse of alcohol, the condition is highly dangerous, owing to the interference with digestion and nutrition thus brought about, and the patient may gradually sink from marasmus. Persistent dyspepsia occurring in the course of various chronic diseases often materially increases the gravity of their prognosis.

2. **Gastralgia** is frequently difficult to get rid of, and may prove serious, especially in elderly persons, on account of the severity of the pain, and because this prevents them from taking food.

3. **Gastric ulcer** is necessarily a dangerous lesion. The variety which occurs in young women is the more immediately grave, on account of its tendency to perforation and hæmorrhage. A large proportion of presumed cases of perforating ulcer, however, recover, the ulcer being supposed to cicatrize. The chronic ulcer shows much less disposition to heal, but is not nearly so liable to lead to a speedily fatal issue, death usually taking place slowly by asthenia. In proportion to the severity of the stomach-symptoms—pain, vomiting, and hæmorrhage—is the prognosis more grave. The effects of cicatrization may also prove serious.

4. **Cancer** is necessarily a fatal disease, and the question can merely be one of duration. This must be determined in each particular case by the characters of the symptoms; and the progress of the malady. Rarely does the duration extend beyond two years, and generally it is much shorter than this.

III. TREATMENT.

There are certain obvious indications to be followed in the management of all chronic gastric affections, and these will now be considered, anything calling for special notice being pointed out in the course of the remarks.

1. Regulation of the diet is evidently the first consideration in all cases. This involves not merely directions as to what kinds of food should be taken, but also with regard to quantities, intervals between meals, proper mastication, and other matters. In many cases of dyspepsia this regulation of diet is the chief thing needing attention, without which all other means are usually unavailing. It would occupy too much space to point out all the modifications of diet required in different forms of stomach derangement, and, indeed, this has generally to be determined by the experience of each individual patient. There are, however, certain broad rules which may be laid down. In all cases substances which are known to be indigestible, such as pastry, cheese, many fruits and vegetables, fresh bread, and most made-dishes, must be avoided, plain food only being taken. Meat is decidedly beneficial in atonic dyspepsia, fresh beef and mutton, not too fat and properly cooked, being the kinds of meat which are most suitable. Pork, veal, and salted meats must be forbidden. In proportion to the degree of irritation present, and especially should there be distinct evidence of chronic gastritis, does it become requisite to order a more bland and easily digestible diet. In such cases white fish, light soups, chicken, game, jellies, calves' feet, sweetbread, the yolk of eggs, milk-puddings, and articles of this kind answer best, and it is often better to give food in small portions at rather frequent intervals, than in any considerable quantity at a time. Care must always be exercised in the use of hot condiments.

The question of *drink* calls for special notice. Many patients suffer from abuse of tea, and it is frequently desirable to forbid this absolutely, and order cocoa or milk instead, the latter being advantageously mixed with lime-water or soda-water. Instructions must also be given against taking large quantities of cold water, especially during meals. Any abuse of alcoholic drinks must of course be at once put a stop to. A glass of good bitter ale or stout with meals is often beneficial in atonic dyspepsia, provided it does not produce flatulence; a moderate quantity of wine may also be useful, just before and with food, especially dry sherry, champagne, claret, or hock. When there is an irritable condition of the stomach, much care must be exercised in the use of stimulants.

In *functional disorders* of the stomach attended with *severe pain after food*, it is sometimes requisite to insist upon patients taking their meals properly, as they will otherwise go without food, and are thus only aggravating the mischief; underdone meat is beneficial in many of these cases, and it may be pounded. Where mastication is impracticable, food must be artificially divided before it is taken; and in the case of old people and others who have lost their teeth, as well as in

some instances where individuals have very irregular teeth, it is often extremely serviceable to provide them with an artificial set.

In treating *gastric ulcer*, especially the *perforating* variety, diet is all-important. In order to promote the healing process, and to guard against untoward events, one main indication is to keep the stomach in as absolute a condition of rest as possible. Hence anything which is in the least degree liable to irritate this organ, or to give rise to flatulent distension, must be entirely avoided. Further, the food should consist of liquids or pulpy materials, such as thick soups, pounded underdone meats, or meat-extracts; milk, either alone or thickened with corn-flour or arrow-root; and the yolk of eggs beaten up or soft boiled; and even these must be given only in small and regulated quantities, at stated intervals. In treating *perforating ulcer* it has with good reason been recommended that the patient should be kept in bed for some weeks, so that less nutriment may be required, and thus the stomach be less disturbed. Some have even gone so far as to advocate that the system should be entirely supported by nutrient enemata, but this is rarely required.

In connection with *cancer* no definite rules can be laid down, but as digestible and nutritious food as possible must be given, each case being managed on its own merits. It may not be altogether useless to remember that, both in cancer and ulcer, the position assumed during and after the taking of food has sometimes a decided influence in the way of relieving pain and other symptoms.

In some cases of gastric disease it is requisite to be particular as to the *elements of food* which are permitted. Thus, if there is much tendency to acid fermentation, starchy substances are contra-indicated. Marcet and Pavy have recommended in certain conditions the employment of food artificially digested before its administration.

2. The next matter requiring attention is **general hygienic management**. Many cases of functional disorder of the stomach, as well as of chronic catarrh, and even of ulceration, are greatly benefited by attention to various matters coming under this head, of which only the chief can be here mentioned, without entering into details, viz., the taking of a proper amount of exercise, though not immediately before or after a meal; avoidance of undue mental work, harassing anxiety, and brooding over symptoms; mingling in cheerful society; change of air and scene; abstinence from injurious habits, such as intemperance or excessive smoking; promotion of the action of the skin by cold bathing or douching, if this agrees, or by an occasional warm bath or Turkish bath; and the wearing of warm clothing, with flannel next the skin.

3. Coming, in the next place, to **medicinal treatment**, first, those therapeutic agents require notice which *act directly upon the stomach*. These must not be given indiscriminately, and much care is required in their administration. They act by increasing the appetite; giving tone to the stomach and aiding its muscular contractions; promoting the secretion and improving the quality of the gastric juice, or, on the other hand, checking excessive secretion; or by producing a sedative effect upon the stomach. The chief remedies include *alkalies*, viz., liquor potassæ and the carbonates of soda, potash, or

ammonia; *mineral acids*, especially hydrochloric, nitro-hydrochloric, and phosphoric; tincture or extract of nux vomica or strychnia; cinchona or quinine, which, however, must be used with particular caution, as they are apt to disagree; *vegetable* and *aromatic bitters*, viz., calumba, gentian, orange-peel, quassia, chiretta, cascarilla, chamomile, absinthe, and hop; *carminatives* and *stimulants*; carbonate or nitrate of bismuth. These may be variously combined, and among the most useful combinations may be mentioned bicarbonate of soda with tincture or infusion of calumba, or gentian and aromatic spirits of ammonia; dilute hydrochloric acid with the same bitters, or with tincture or infusion of orange-peel, to which tincture of nux vomica (m_v to x) may often be very advantageously added; bismuth with carbonate of soda and some bitter infusion. Hydrocyanic acid is in many cases a useful addition to these mixtures. When giving the vegetable bitters, it is desirable to begin with a moderate dose, as they are sometimes apt to disagree at first. Medicines which promote secretion are best administered shortly before or during meals. Alkalies certainly act in this way; acids may be used to check excessive secretion, when given just before meals, but their continued administration also seems to increase and improve the quality of the gastric juice, by improving the condition of the lining membrane of the stomach and its glands. Ipecacuanha, in doses of gr. $\frac{1}{2}$ to i in pill, has been recommended as a promoter of secretion; and also hot condiments and other stimulants. The last-mentioned are useful in some cases, but the habit of always taking alcoholic stimulants before meals is decidedly to be deprecated.

When there are evidences of much *gastric irritation*, most benefit is usually derived from the use of bismuth with alkalies and hydrocyanic acid, to which solution of morphia (m_{ij}—x) may be added, should there be much pain. Sometimes, however, mineral acids act well in this condition; and occasionally, even when there have been distinct signs of subacute gastritis, I have known strychnine to be the only remedy affording relief. In cases of continued gastrorrhœa some of the most efficacious medicines are oxide of zinc, oxide or nitrate of silver in minute doses, and *vegetable astringents*. Arsenic is also recommended. Opium or morphia is of great value in some morbid states of the stomach, particularly in that which is due to chronic alcoholism. Dr. Wilson Fox has found the compound kino powder very useful in these cases. In that variety of indigestion in which the food passes immediately out of the stomach, I have found most benefit from the administration of bismuth shortly before meals, combined with tincture of opium (m_{ij}—vi).

Important remedies are also employed as *substitutes for the gastric secretion*, namely, hydrochloric acid and pepsine, either separately or in combination. In some cases it is advisable to mix these with the food before it is taken; or they may be administered during or after meals. They aid also in preventing the decomposition of food, which is so apt to occur. Lactic acid has been likewise used for this purpose; and lacto-peptine has of late come much into use in the treatment of dyspeptic cases.

The drugs thus far considered are often of service in cases of

cancer and *chronic ulcer*, and either of them may be tried, should symptoms seem to indicate a necessity for its administration. With regard to medicines which directly promote the *healing of an ulcer*, nitrate and carbonate of bismuth are supposed to act thus (gr. x every four or six hours), and also nitrate or oxide of silver; either of these may be combined with opium or morphia. There is no known remedy which has the least direct influence upon cancer of the stomach.

4. **Symptomatic treatment** almost always demands attention in the various stomach-complaints. The chief symptoms which call for interference are *pain*; *nausea* and *vomiting*; *heartburn* and *acidity*; *flatulence*; *eructations*; *pyrosis*; *constipation* or *diarrhœa*; and, in certain cases, *hæmatemesis* or *perforation*. The treatment of most of these has already been fully considered. Pain may be relieved by opium, morphia, hydrocyanic acid, belladonna, conium, spirits of chloroform, or chloral internally: with external applications over the epigastrium, namely, dry or moist heat; cold in some cases, especially of cancer; anodyne fomentations; turpentine stupes; sinapisms; or, if the pain is continuous, a small blister, which may be dressed with morphia, or a belladonna or opium plaster. If the pain is severe, subcutaneous injection of morphia may be employed. Frequently painful sensations are associated with flatulence or acidity, being relieved on removing these conditions. Flatulence and eructations are usually much diminished by the use of the medicines already considered, which act upon the stomach and food. A combination of bismuth with freshly-prepared charcoal, given after meals, is efficacious in preventing the former; as well as such remedies as assafoetida, galbanum, musk, valerian, sumbul, spirits of ammonia, oil of rue or cajeput, and peppermint. Sometimes small doses of creosote, carbolic acid, sulpho-carbolate of soda (gr. x—xv), or hyposulphites may be given with benefit. Acidity and heartburn are best relieved by carbonate of soda or potash, or by magnesia or carbonate of magnesia. Frequent acid eructations are generally an indication for *mineral acids*; they may depend either on excessive formation of gastric juice, or on fermentation of food from deficiency of this secretion, and the consequent formation of various organic acids. Pyrosis is usually checked by bismuth in full doses, combined with alkalis. *Aperients* are often required, but should there be habitual constipation, it is very important to avoid the constant employment of strong purgatives, if possible. Vichy, Seltzer, Friedrichschall, Hunyadi Janos, and other mineral waters are often very serviceable for relieving this symptom.

5. It must not be forgotten that the state of the **general system**, as well as that of the main **organs**, needs due consideration in all cases of stomach disorder. Many of the remedies already alluded to act as general *tonics*, and thus aid in improving digestion. Among the conditions requiring particular notice are *anæmia*, which must be treated by mild ferruginous preparations; hepatic derangements, calling for an occasional dose of mercury or podophyllin; gout; hysteria; malarial affections; and renal disease. Gastralgia is much benefited by the administration of iron, strychnia, and various other *nervine tonics*.

6. In the management of those conditions in which the stomach is much dilated, it has been recommended to use the stomach-pump systematically; and also to wash out the organ, using various injections, especially those of an *antiseptic* character.

CHAPTER XIX.

ON CERTAIN INTESTINAL SYMPTOMS AND FUNCTIONAL DISORDERS.

I. ENTERALGIA—INTESTINAL COLIC.

ÆTIOLOGY.—It is very probable that neuralgic pains may be felt in connection with the intestines, corresponding to gastralgia in the stomach; intestinal colic, however, is attended with irregular spasmodic contraction of the muscular coat. Its causes are:—1. *Direct irritation of the bowels* by improper or undigested food; cold drinks or ices; irritant, acrid, or poisonous substances; excessive or morbid secretions, especially bile; retained fæces, colic being often associated with constipation and flatulence; and foreign bodies, such as fruit-stones, gall-stones, or worms. 2. *Organic diseases* of the intestines; and the different forms of *intestinal obstruction*. 3. *Reflex irritation*, as from ovarian and uterine affections; or during the passage of a renal or hepatic calculus. 4. *Morbid conditions of the blood*, especially in gout and perhaps rheumatism. 5. *Lead-poisoning*. 6. *Disorders of the nervous system*, particularly in connection with hysteria, or as the result of strong emotion. 7. Occasionally *exposure to cold*, either generally or locally.

SYMPTOMS.—These are usually quite characteristic. Paroxysmal pain is felt in the abdomen, often coming on quite suddenly, and presenting remissions or intermissions. It generally begins and is most severe about the umbilical region, but may spread over the entire abdomen, and is liable to change its site constantly. As a rule the pain is of considerable intensity, being sometimes most excruciating during the exacerbations, while in character it is more or less twisting, pinching, or constricting, what is commonly called *gripping*. Pressure almost always gives marked relief, the patient either bending forwards and pressing with the hands, or lying upon the abdomen; at the same time being very restless, rolling and tossing about from time to time. Should the spasm continue for a long time, a little soreness may be left. Ordinarily the bowels are constipated, and distended with flatus; diarrhoea may be present, however, in some conditions. Occasionally vomiting takes place, but then probably the stomach is affected. *Physical examination* generally discloses flatulent distension, except in lead colic; while the spasmodic movements of the bowels, and rolling about of flatus, can often be felt. The abdominal muscles are also commonly in a state of rigid contraction, or they may be knotted here and there.

The patient presents an expression of suffering, and if the pain is very severe and prolonged there may be signs of more or less collapse. Pyrexia is absent. The attack lasts a variable time, and usually ends abruptly, being followed by a feeling of great relief and comfort.

TREATMENT.—The first thing to be attended to is to find out the cause of an attack of intestinal colic, and to get rid of this. A free *aperient enema* is generally useful, to which may be added some turpentine or assafoetida, if there is much flatulence; or a brisk *purgative* may be given by the mouth in less urgent cases, such as a full dose of castor oil, either alone or preceded by calomel, a black draught, or one containing sulphate and carbonate of magnesia with peppermint-water. Opium is the chief remedy for the relief of pain and spasm; it is best given in the form of tincture or liquor opii sedativus, which may be combined with spirits of chloroform and tincture of cardamoms. In severe cases subcutaneous injection of morphia may be employed. Warm *carminative* drinks are also beneficial; or a little hot spirit and water may be given. Should the attack be associated with hysteria, a draught containing tincture of valerian or assafoetida is indicated. The patient should be kept warm; and the assiduous application of dry heat over the abdomen, with friction, will usually afford great relief. In some cases hot fomentations answer best. Any signs of collapse must be combated by *stimulants*. It may be remarked that infants probably often suffer from intestinal colic, on account of improper feeding. This may be prevented by careful attention to their diet; but should it arise, *carminative waters* may be given, along with magnesia or a little castor oil, and heat applied over the abdomen.

II. CONSTIPATION.

ÆTIOLOGY.—The immediate causes of this very common symptom may be summed up as:—1. *Mechanical obstruction* in some part of the alimentary canal, directly interfering with the passage of the fæces. 2. *Deficient peristaltic action* of the intestinal muscular coat, especially of that of the large bowel, generally due to impaired excitability of the nerves. 3. *Deficiency of secretions*, particularly of the intestinal secretion and bile; or, as some believe, their *excessive absorption*; the fæces being consequently too solid, while at the same time the peristaltic action is diminished.

The first class of causes will be separately considered. The other two classes may be associated with *organic diseases*, but are very frequently the consequence of mere *functional disturbance*. This may arise from a great variety of causes, of which the chief are habitual neglect of the act of defæcation, either from carelessness, want of time, or undue modesty; indulgence in astringent articles of diet; habitual use of opium; excessive smoking; sedentary habits, especially if combined with much mental work; enervating habits, particularly lying in bed to a late hour; anæmia, debility, and want of tone from any cause; hepatic derangements; most acute febrile diseases; various chronic affections, especially those connected with the nervous system; uterine and ovarian derangements; and the presence of lead in the system.

Undoubtedly some individuals are predisposed to constipation, par-

ticularly those who are of a slow, lethargic temperament. This disorder is more common in females, and is more liable to arise as age advances, though it is of very frequent occurrence in young women.

SYMPTOMS.—Constipation simply means that the stools are not passed with sufficient frequency, being at the same time generally deficient in quantity, as well as too dry and solid. In many instances it is a mere temporary derangement; but in others the bowels are habitually confined. Some individuals state that their bowels are regular, simply because they go to stool every day, but in reality they suffer from habitual constipation, as they only pass small lumps of hard fæces; hence the necessity of making close enquiry in any doubtful case. The degree of constipation varies much, but it is not uncommon to meet with patients, especially females, whose bowels are only moved once or twice a week; and sometimes the intervals are even longer than this, being in exceptional cases quite extraordinary. Hence fæces may accumulate to an enormous amount in the intestines, distending them greatly; and when discharged, they are firm, often extremely hard, dry, in the form of scybalous lumps or large masses, frequently pale, and unusually foetid. Hard excrement may cause irritation, setting up a kind of diarrhoea attended with the discharge of mucus or pus, and thus may mislead as to the actual conditions present, the fæces being in reality retained. The passage of indurated fæces may give rise to a great deal of pain about the anus, with straining, and sometimes discharge of blood. When retained, excrement is very liable to undergo decomposition, thus giving rise to much painful flatulence; the secretions are also still more interfered with, as well as the motor functions of the bowels, and dyspepsia, usually of an atonic kind, is set up. The mechanical effects of accumulated fæces are often very serious, and they may cause complete intestinal obstruction, or may lead to ulceration and perforation. Not uncommonly an accumulation can be detected by *physical examination* of the abdomen, and it may simulate various abdominal tumours. As a rule tumours, due to accumulation of fæces, correspond in position and shape to the cæcum, or to some part of the colon; they often have a doughy feel, yielding to pressure, by which they are sometimes much altered; and percussion over the corresponding part of the abdomen generally elicits a combination of dulness and tympanitic sound. In some cases, however, these accumulations produce extensive, irregular, solid enlargements, greatly resembling masses of cancer. Therefore the possibility of any doubtful abdominal tumour being due to fæces should always be borne in mind, and the effects observed of a thorough clearing-out of the bowels by means of aperients and enemata, before a positive opinion is given.

Upon the general system the effects of habitual constipation are frequently very marked. It produces a state of nervous depression; and by interfering with digestion and nutrition, may cause much wasting and anæmia.

TREATMENT.—It is needless to enumerate here the ordinary remedies employed in the treatment of accidental and temporary constipation, as these are discussed in treatises on Therapeutics, and are alluded to in other parts of this work. A few remarks are, however, necessary regarding the management of habitual constipation. 1. It is most

important to impress upon patients the necessity of attending to the *habit* of going to stool daily, at the same hour, and of having a proper evacuation, because, if this is neglected for a long period, it becomes extremely difficult to restore the bowels to their normal activity.

2. *Change in diet* may assist in removing constipation. Astringent articles of food must be avoided. Bran-bread, oatmeal cakes, and porridge certainly prove efficacious in not a few cases; and figs or somewhat acid fruits are also useful in some instances. Any injurious habits which tend to confine the bowels must be avoided; and a proper amount of daily exercise should be taken. Cold bathing with douching of the abdominal walls is often beneficial; and, in women, in whom these walls are relaxed, the plan of wearing a broad bandage or elastic support round the body, firmly applied, is exceedingly serviceable.

3. It must not be forgotten that the inactivity of the bowels may be due to a general want of tone, and hence *tonics* are frequently useful, particularly those which improve the condition of the alimentary canal. The most beneficial are the non-astringent preparations of iron; mineral acids with bitter infusions or tinctures; strychnia, or extract or tincture of nux vomica. Should there be any lead in the system giving rise to constipation, iodide of potassium is the essential remedy.

4. Various *aperient* medicines have usually to be employed, but it is highly desirable to avoid falling into the habit of relying upon these agents, if possible, especially the stronger purgatives, and, therefore, as soon as the desired effect has been produced in any case, and the bowels have been properly emptied, purgatives should be stopped, and the patient impressed with the importance of trying to keep up a regular action, by attention to the matters already indicated. Among the most efficacious aperients in these cases are confection of senna or sulphur, taken early in the morning; compound rhubarb pill; sulphate of magnesia, $\frac{3}{4}$ to $\frac{3}{i}$ three times a day, which is often beneficially combined with sulphate of iron; sulphate of soda; Scidlitz powders; sulphate of potash, particularly recommended for children; aloes, in the form of watery extract or decoction, especially valuable if the colon is torpid; and extract of belladonna in doses of $\frac{1}{8}$ th to $\frac{1}{4}$ th gr. once daily. The last-mentioned has deservedly come into high repute, and has been particularly recommended by Trousseau; a combination of this remedy with aloes and extract of nux vomica is very serviceable in some cases. Not uncommonly it becomes necessary to use stronger purgatives from time to time, such as extract of colocynth, blue pill, calomel, jalap, or gamboge. If the bile appears to be deficient, podophyllin and other cholagogues are valuable, or some recommend inspissated ox-gall. Some of these remedies may be given in different combinations with advantage, made up into pills with extract of gentian or extract of hyoscyamus. It seems best to administer them just before or during a meal. Various *aperient mineral waters* are often serviceable; of these Friedrichschall water is deservedly in high repute, and I have found, in several cases, great benefit follow the habitual use of Hunyadi Janos water.

The employment of *simple enemata* in cases of habitual constipation is not carried out to the extent which it deserves. Unquestionably a morning injection of water, soap and water, or a solution of salt, will

often prove highly efficacious; if necessary a little castor oil may be added. The use of a suppository of soap is a popular remedy in some parts, especially in the case of children. It has been recommended to galvanize the abdominal walls in obstinate cases.

Occasionally, as the result of long-continued accumulation, the rectum becomes greatly distended with solid and dry excrement, which has to be mechanically scooped out. Enemata may be used for the purpose of aiding in softening this hardened fæces, and breaking it down.

III. DIARRHŒA.

ÆTIOLOGY.—Diarrhœa results either from increased peristaltic action of the intestines; an unusually liquid state of their contents, especially when this depends on excessive secretion; or, most commonly, from a combination of these conditions. The *exciting causes* of these morbid phenomena may be thus arranged:—1. *Irritation of the intestines* by food, either taken in excess, of improper quality, undigested, or having undergone decomposition; impure water or other liquids; purgative medicines and irritant poisons generally; excessive or unhealthy secretions, especially bile; worms, trichinæ, and other parasites, possibly vegetable as well as animal; or retained fæces. 2. *Mechanical congestion of the intestinal vessels*, owing to some obstruction in the portal circulation. 3. *Organic affections of the intestines*, viz., enteritis, either acute or chronic; albuminoid disease; and ulceration. 4. Occasionally mere *nervous disturbance*, such as strong mental emotion; or reflex irritation in connection with dentition. 5. Certain *diseases* in which diarrhœa is a prominent symptom, especially cholera, typhoid fever, and dysentery. By many it is then regarded as *eliminatory* in its character, serving to carry off some poisonous material; and the same theory is applied to its occurrence in renal disease, gout, pyæmia, and various fevers; or when it takes place as a *critical discharge* at the close of pyrexial affections. Colliquative diarrhœa not unfrequently sets in during the course of certain wasting chronic affections, especially towards their termination, aiding in bringing about a fatal result, especially in phthisis, cancer, splenic or supra-renal disease, and Hodgkin's disease. 6. The rapid suppression of discharges, or the absorption of dropsical fluid, when the diarrhœa is termed *vicarious*. 7. Causes of a more *general* character, viz., exposure to changes of temperature, or to excessive cold or heat; foul air, over-crowding, and other anti-hygienic conditions; excessive fatigue; emanations from decomposing animal matter; and malarial influence. The combined action of some of these causes, along with improper diet, gives rise to the *summer* and *autumn diarrhœa* or so called *English cholera*, so prevalent at those seasons. 8. Very rarely the *escape of some fluid accumulation* into the intestines, such as the contents of an abscess, peritoneal effusion, or the fluid portion of a hydatid tumour.

CHARACTERS.—In all cases of diarrhœa it is requisite to ascertain its duration; the number of stools passed in the twenty-four hours; and their relation to the introduction of food, if any: and also to inspect *specimens of the excreta*, if practicable, as frequently as may be desired. The principal varieties of loose stools are fæculent; lenteric,

when they contain cognizable fragments of food, in some cases scarcely at all changed; bilious; serous or watery, also called a *flux*; mucous or gelatinous; bloody; fatty; purulent; chronic or white flux. As a rule the materials are more or less mixed, and by an examination of the characters of the stools the cause of the diarrhœa may often be determined. Various other digestive disturbances are usually associated with this symptom, indicated by griping or other pains in the abdomen, sickness, borborygmi, straining at stool, or an abnormal state of the tongue. The stools may irritate the anus considerably, especially when the diarrhœa is long-continued and of a watery kind. It must be remarked that patients sometimes state that they are suffering from looseness of the bowels, when on investigation it will be found that there is only some local discharge, especially in connection with fistula in ano. The association of mucous discharge with retained fæces has already been alluded to.

If diarrhœa is considerable or of long duration, it necessarily causes more or less debility and wasting, in some instances very rapidly and markedly reducing the patient.

TREATMENT.—The first matter as regards the treatment of diarrhœa is to determine whether it should be checked or not. In some instances this is not desirable, provided it is not excessive, the discharge by the bowels being preservative and beneficial, as, for instance, in connection with Bright's disease or portal congestion. Some even go so far as to promote diarrhœa in certain diseases, such as cholera and typhoid. As a rule it is necessary to check this symptom either entirely or partially. For this end the *diet* must be strictly regulated, and this may be the only thing needed, especially in the case of children. Milk with farinaceous articles, especially arrow-root and corn flour; weak beef-tea thickened with these materials; and milk puddings, constitute the best articles of diet. Milk with lime-water, if administered in small quantities, and at proper intervals, will often speedily put a stop to the diarrhœa of children. In some cases a little brandy and water, or a mixture of brandy with port wine, is beneficial. Not uncommonly an *aperient* is indicated at the outset, with the view of getting rid of irritant materials from the alimentary canal. Castor oil, calomel, a saline draught or Seidlitz powder, or a full dose of tincture of rhubarb act best in these cases, and they are often advantageously combined with a little opium. *Antacids*, such as carbonate of soda or magnesia, are beneficial when irritating secretions are present in the bowels.

Among the *direct remedies* for combating diarrhœa opium holds the first place, given either alone or with other medicines, in the form of pill, tincture, confection, various powders, enema, or as syrup of poppies. An injection of ℥xv-xx of laudanum with ℥iiss-ij of decoction of starch often acts most beneficially. The other principal medicines administered in *acute* cases are prepared chalk, aromatic confection, catechu, kino, logwood, krameria, alum, dilute mineral acids, especially sulphuric, tannic and gallic acids, carbonate or nitrate of bismuth, chloral, and chlorodyne; in *chronic* cases tincture of sesquichloride or solution of perntrate of iron, acetate of lead, sulphate of copper, or nitrate of silver. Ipecacuanha is invaluable in certain forms of diarrhœa. Among the most efficient combinations will be found

chalk mixture with tincture of catechu and opium; compound chalk-powder, with or without opium; compound kino powder; decoction of logwood with lime-water, particularly valuable for children; dilute or aromatic sulphuric acid with laudanum; Dover's powder, alone or with carbonate of bismuth; and, in chronic cases, pills containing acetate of lead or sulphate of copper, combined with opium.

Creosote, carbolic acid, and other *antiseptics* have been employed in certain forms of diarrhoea, with the view of destroying vegetable parasites upon which this symptom is supposed to depend.

Local applications to the abdomen are frequently very beneficial, in the form of poultices, fomentations, or dry heat. A flannel bandage worn round the abdomen is useful in some chronic cases. Occasionally a patient may by voluntary effort to some extent suppress diarrhoea, especially when this is due to emotional disturbance.

IV. MELÆNA—INTESTINAL HÆMORRHAGE.

ÆTIOLOGY.—Most of the causes of melæna are similar to those which give rise to hæmatæmesis, and it will be sufficient briefly to enumerate them thus:—1. *Traumatic injury*. 2. *Diseased conditions of the blood*. 3. *Vicarious*. 4. *Mechanical and chemical irritation or destruction* of the bowel, especially by violent purgatives, cantharides, turpentine, various irritant poisons, hardened fæces, and rough calculi. 5. *Organic diseases*, viz., enteritis, ulceration, especially in typhoid fever and dysentery, cancer, invagination, piles, prolapsus, fissures or fistulæ about the anus. 6. *Extreme mechanical congestion*, from portal obstruction or chronic heart or lung disease. 7. A *tumour* eating its way through the wall of the intestine; or an *aneurism* bursting into its cavity. 8. Passage of blood *from the stomach* into the bowels, following hæmorrhage into this organ.

CHARACTERS.—When blood appears in the stools, it is generally much altered in its characters, but this will depend upon its amount and source, and upon the rapidity with which it escapes. When in small quantity, coming from the upper part of the bowels, and being slowly discharged, it is usually more or less dark, being often quite black, and presenting a tarry or sooty aspect; occasionally it resembles coffee-grounds. If originating from the same source, being at the same time copious and speedily expelled, it may be but little altered, though it is usually of a very dark colour. When coming from the large intestines, especially near the anus, it is generally quite bright and unchanged. The quantity varies much, ranging from mere streaks in the fæces to an amount sufficient to cause speedy death. By attending to the quantity and appearances of the blood, its seat of origin may generally be determined, the diagnosis being further aided by the general history of the case; and by a consideration of the symptoms and physical signs referable to the abdomen, not forgetting to make an examination of the anus and its vicinity. Care must be taken not to mistake the dark colour due to bile or iron for that depending on the presence of blood in the stools.

TREATMENT.—The same remedies are useful in the treatment of melæna as have been recommended for hæmatæmesis. Oil of turpentine

is in much repute. Enemata of *iced water* are sometimes serviceable; as well as the application of iced-bags to the abdomen. *Astringent* enemata may also be indicated in some cases. If there is any morbid condition about the anus giving rise to hæmorrhage, such as piles or fistula, as well as in certain forms of internal disease, for example, cancer of the intestine, surgical interference may be required.

CHAPTER XX.

INFLAMMATION OF THE INTESTINES—INTESTINAL OR ENTERIC CATARRH — ENTERITIS — DUODENITIS — TYPHLEITIS AND PERITYPHLEITIS.

INFLAMMATION of the bowels presents considerable varieties as to the coats which are involved, and as to the extent of the intestinal tract which is implicated; hence the clinical history of this disease is anything but uniform. The term *enteritis* has been used very vaguely, and several distinct conditions have been included under it. It will be convenient briefly to consider in the present article all forms of disease in which the intestines generally, or any portion of them, are inflamed, apart from special affections, such as dysentery or typhoid fever.

ÆTIOLOGY.—The causes of intestinal inflammation are very similar to those which induce gastritis. *Enteric catarrh* or *mucro-enteritis* is ordinarily due to some direct irritation of the mucous lining by food or other materials, or to a cold; it is also frequently associated with various exanthemata, and with dentition. Irritant poisons give rise to more severe inflammation. A very intense *local* form of enteritis follows obstruction of the bowels; this also sometimes results from ulceration, or from extension of peritonitis; and it is said to occur in rare instances idiopathically. The local variety named *typhleitis* or *inflammation of the cæcum* is generally due to the lodgment of hardened feces or of foreign bodies in this part of the intestine, or in the appendix vermiformis, which often ultimately leads to ulceration and perforation. *Duodenitis*, followed by ulceration, is peculiarly liable to be set up after burns and scalds. *Chronic intestinal catarrh* remains occasionally after an acute attack, but usually results from the repeated action of irritants; or the complaint is associated with ulceration, lardaceous disease, or other organic changes affecting the bowel.

ANATOMICAL CHARACTERS.—In the milder forms of intestinal catarrh the appearances resemble those observed in catarrh of other mucous surfaces, and need no special description. The secretions are abundant and often very irritating, being sometimes mixed with blood. Superficial erosions or slight ulcerations are not uncommonly observed. Occasionally a croupous or membranous deposit is formed over the surface more or less extensively, which indicates greater intensity of the inflammatory process. Should this be very violent, implicating the entire

thickness of the gut, the colour is extremely deep red, sometimes purple or almost black, being accompanied with spots of extravasation; all the coats are thickened and softened, and generally infiltrated with serum, or occasionally with exudation or pus; while the intestinal contents are often mixed with blood. Gangrene occurs in some cases. The peritoneum may be involved by extension, exhibiting patches of lymph corresponding to the inflamed bowel.

In *simple catarrh* the entire mucous tract is frequently affected, the condition beginning above and extending throughout the intestines; it may, however, be limited. The more severe forms are usually confined to short portions of the bowel, which are generally much distended, particularly when the inflammation depends upon obstruction, the part beyond being contracted.

In *typhlitis* the cæcum or appendix vermiformis becomes much inflamed from local irritation, and this leads to ulceration and destruction of the coats, which is liable to end in rupture or perforation. The perforation may take place into the peritoneum, causing peritonitis; or into the surrounding cellular tissue, setting up inflammation in this structure—*perityphlitis*—which usually terminates in the formation of an abscess, and this, if not opened, may burst in a variety of directions. Possibly perityphlitis may be excited independently of any actual perforation. The cause of the irritation is usually some foreign body or hardened fæces. In the appendix some small foreign substance which has gained an entrance becomes a nucleus upon which fæces and secretions are deposited, forming concretions which come to resemble fruit-stones, for which they have been frequently mistaken. Of course it must be remembered that perforation may result from other forms of ulceration which are met with in the cæcum; from mere distension of this part of the intestine; or from its destruction by some extrinsic growth. The same course of events is now and then observed on the opposite side of the abdomen, in connection with the sigmoid flexure. A localized variety of inflammation has also been described in the colon—*colitis*—supposed to be distinct from dysentery, beginning in the submucous tissue, but soon causing extensive destruction of the mucous membrane.

When intestinal catarrh becomes *chronic*, there are the usual changes in colour, this being often dark or even black from pigment; thickening and induration of tissues; with degenerative changes in the gland-structures. Chronic catarrh may give rise to ulceration; or, on the other hand, it may result from this condition, or from some other organic change in the bowel.

SYMPTOMS.—1. Cases of *simple enteric catarrh* are generally characterised by uneasiness over the abdomen, with colicky and griping pains, especially about the umbilicus, where there may be a little tenderness, though pressure sometimes gives relief; formation of much gas in the intestines, causing gurgling and borborygmi; and diarrhœa, especially after taking any food or drink, the stools becoming in some cases very numerous, being at first fæculent, but soon assuming a watery, irritating character. These may be the only symptoms, but as the stomach is often implicated at the same time, this is indicated by a red, furred, and dryish tongue, impaired appetite, thirst, and a tendency to nausea.

or vomiting. In *duodenal catarrh* jaundice is frequently observed, owing to the closure of the common bile-duct by the swollen membrane; and if the duodenum is solely involved, there is corresponding localized pain and tenderness, with constipation instead of diarrhoea. Occipital headache is also said to be common in duodenitis. If diarrhoea has been severe for any length of time, the stools are apt to become somewhat dysenteric in character, containing mucus and blood, especially if the large intestines are mainly implicated, when there may also be much tenesmus and straining during defæcation.

The symptoms are more marked in proportion to the intensity of the inflammation, especially the pain and tenderness, and they are particularly severe in connection with *irritant poisoning*. Should there be any membranous deposit upon the mucous surface, shreds, larger patches, or even intestinal casts of this material may be expelled in the stools.

General symptoms are in some cases entirely absent, except, perhaps, some feeling of exhaustion from excessive diarrhoea. In the more severe forms of enteritis, however, pyrexia is observed, with languor, general depression, and headache. In children there is frequently high fever, accompanied with much prostration, a greatly distended abdomen, and aphthous stomatitis. Sometimes convulsions or coma set in, and death may result from this cause, or from exhaustion. In cases of irritant poisoning the general symptoms are grave, there being often a tendency to collapse; and the same thing is occasionally observed in severe enteric catarrh from other causes, especially in persons constitutionally weak, or who are the subjects of some chronic lowering disease.

2. The *limited intense form* of inflammation which involves all the intestinal coats presents symptoms essentially different from those just described, and it is to this variety that many authors limit the term *enteritis*. Here the affected portion of the intestine, which is at first the seat of spasm, soon becomes paralyzed, so that the contents cannot pass along, but accumulate in the part above. The early symptoms include much localized pain, with tenderness, often referred to the umbilical region, and increased by movement; general colicky pains and tormina; obstinate constipation; constant nausea and vomiting; thirst; a furred tongue; and pyrexia, preceded by rigors, the patient presenting a distressed and anxious expression. In a short time, if there is no relief, the abdomen swells on account of tympanitis; while the painful sensations subside more or less, in some cases completely ceasing; the vomiting gradually becomes stercoraceous, at last the materials coming up without any effort; the tongue assumes adynamic characters; and signs of collapse set in, with a pinched countenance, and an extremely feeble and irregular pulse, the brain being either unaffected to the last, or death being preceded by low nervous symptoms. The urine becomes much diminished or suppressed. Hiccup is often a distressing symptom.

3. *Typhlitis* is generally indicated at the outset by pain and tenderness in the right iliac fossa, often severe; with, in some instances, distinct *physical signs* of an accumulation in the cæcum; and constipation, which may be followed by mucous or muco-purulent diarrhoea. *Sudden*

perforation may take place into the peritoneum, even when there have been no previous symptoms of any moment. In other cases *perityphlitis* is set up, as evidenced by local redness; a firm swelling; œdema of the skin; increase of pain and tenderness; rigors and pyrexia; followed usually by signs of the formation of an abscess, which may open in various directions, either externally or internally, sometimes thus setting up peritonitis. The pus has often a fœcal odour, and may be mixed with actual fœces or intestinal gas. If the case does not prove speedily fatal, a permanent fistulous opening may remain, death occurring gradually, preceded by hectic symptoms; or ultimately recovery may ensue, the abscess healing up. The same symptoms are observed in rare instances in the left iliac fossa, in connection with the *sigmoid flexure*.

4. *Chronic intestinal catarrh* is frequently attended with no other symptom than chronic diarrhœa, the stools being liquid, pale, fermented, and often very offensive or lenteric, varying much in number and quantity. In many cases uneasy griping sensations and gurgling are experienced from time to time; or there may be some degree of soreness over the abdomen. Gastric symptoms are generally present, and the tongue often presents abnormal characters. Owing to interference with digestion and nutrition, more or less wasting is commonly observed, as well as slight pyrexia in some cases, especially towards evening.

DIAGNOSIS.—The chief affections for which the various forms of *acute intestinal inflammation* are liable to be mistaken are simple diarrhœa, or diseases attended with this symptom, especially typhoid fever and dysentery; intestinal colic; peritonitis; painful affections of the abdominal walls; or in the case of typhlitis and its consequences, local inflammation or an abscess in the right iliac fossa due to other causes, and certain tumours.

There can be no doubt but that many ordinary cases of diarrhœa are the result of enteric catarrh, and it is often impossible to separate them. The characteristic symptoms of typhoid fever and dysentery are usually sufficiently distinctive. Simple colic is recognized by the characters of the pain; the absence of fever; and the presence of constipation. Peritonitis is readily separated from mere catarrhal inflammation by the intensity of the pain and tenderness, constipation, great constitutional disturbance, and other symptoms; but as regards severe localized *enteritis*, it is by no means easy to distinguish between the two diseases. Indeed, in most instances the peritoneum is involved along with the other intestinal coats, and this is more evident if the pain and tenderness are marked, superficial, and extensive. Colicky pains are suggestive of inflammation of the more internal portions of the wall of the bowel. It is important to bear in mind *duodenal catarrh* as a not uncommon cause of jaundice.

In cases of *chronic intestinal catarrh* the main point to be determined is whether this is of a simple nature; or if it is associated with ulceration or amyloid degeneration. The special characters of intestinal ulceration will be presently indicated. Lardaceous disease of the bowels is almost always preceded by distinct clinical evidences of other organs being affected; as well as by one of the known causes of, and the constitutional condition accompanying this morbid state.

PROGNOSIS.—Ordinary *enteric catarrh* usually ends favourably, but it may become chronic. If intense, however, or if it occurs in children, in very weak subjects, or as a complication of acute or chronic diseases, it may become highly dangerous and end fatally. The severe form of *enteritis* is extremely grave. *Typhlitis* is also necessarily attended with many dangers. *Chronic catarrh*, especially if long established, is often very difficult to cure, and may itself ultimately prove fatal; while it adds to the gravity of other chronic diseases, by interfering with the nutrition of the patient.

TREATMENT.—The remarks made with respect to *diet* in the case of stomach-disorders, apply with almost equal force to those affecting the intestines. In *acute catarrh* of the bowels, if there is anything causing irritation, it is desirable to get rid of this by means of a dose of tincture of rhubarb, castor oil, or some other simple *aperient*, or by an enema. As regards *internal remedies*, the most serviceable combination in my experience consists of bismuth, with alkalies, and small doses of tincture of opium. An enema containing laudanum is also very useful after all irritant matters have been evacuated; and the various other remedies recommended for diarrhoea may be had recourse to if required. In duodenal catarrh it is necessary to give small doses of some *saline aperient*, such as sulphate with carbonate of magnesia, which may be preceded by a dose of calomel. *External applications* over the abdomen, especially heat and moisture, are often beneficial. Ordinarily there is certainly no necessity for removal of blood, but in the early stage of the more serious forms of inflammation it may be permissible to apply a few leeches to the abdomen, provided the patient is in a fit condition. When the inflammation is accompanied with obstruction, the main points in treatment are to avoid giving purgatives; to administer opium freely, either by the mouth, enema, or subcutaneous injection of morphia; to support the patient, especially by enemata; and to treat the prominent symptoms, particularly pain, nausea, vomiting, and tympanitis.

Typhlitis and its consequences need constant fomentation and poulticing; perhaps the application of a few leeches in some cases; and the administration of opium internally. If an abscess forms, it should be encouraged towards the surface, and the pus evacuated when the proper time arrives. If an accumulation can be felt in the cæcum, it may sometimes be squeezed out by gentle manipulation, but much care is necessary in practising this measure.

Chronic enteritis will probably require some of the more powerful *astringents* alluded to under diarrhoea. Powders containing carbonate of bismuth, gr. v–xx, with Dover's powder, gr. iij–vi, act very beneficially in some cases. Tincture of steel is also a valuable drug in this complaint, when given in full doses—℥ xx–xxx. In obstinate cases *counter-irritation* over some part of the abdomen, especially over the right iliac fossa, by means of blisters, tincture of iodine, or croton-oil liniment, may prove of service.

CHAPTER XXI.

DYSENTERY—BLOODY FLUX.

ÆTIOLOGY.—Dysentery occurs as an acute and chronic disease, and may assume a sporadic or epidemic character. Different views are held as to its immediate *exciting cause*, viz. :—1. That it is due to a malarial poison, originating in vegetable decomposition, and rising from the soil. 2. That though primarily originating in this manner, it may be afterwards propagated from one individual to another, by means of a contagious specific poison, conveyed, as some suppose, only by the stools, especially through their being mixed with drinking-water; or, as others believe, by all the excretions and exhalations. 3. That it is independent of any specific poison, and merely results from certain general causes which tend to produce intestinal congestion and inflammation, such as exposure to cold, especially to night chills and dews; errors in diet, especially want or improper quality of food; excessive use of salt meat; drinking impure water or irritating liquors; or indulgence in excess of; or in sour fruit. Those who regard the malady as *specific*, consider the causes just mentioned as merely *predisposing*, or as aiding in *propagating* the poison, but it is highly probable that they may at all events *excite* the sporadic form. Amongst other *predisposing* and *propagating causes* are recognized a hot and moist climate, especially during the seasons when the nights become chilly, most cases occurring in the autumn, and particularly after much exposure to night air; over-crowding and filth; bad ventilation, especially if accompanied with exposure to emanations from any kind of decomposing organic matter; and physical exhaustion. Dysentery may complicate or follow certain diseases, particularly ague, or remittent fever, scurvy, relapsing fever, cholera, or syphilis; as well as the state of system resulting from the action of prolonged heat. Ague and chronic dysentery were not uncommonly met with together in the case of sailors admitted under my care at the Liverpool Northern Hospital; and occasionally the latter complaint accompanied scurvy. *Chronic dysentery* always originates in the acute form.

ANATOMICAL CHARACTERS AND PATHOLOGY.—In general terms dysentery may be said to be characterized anatomically by inflammation of the large intestines, ending in ulceration or gangrene; with exudation on the mucous surface. According to the view entertained as to the origin of the disease, the inflammation is considered by different authorities as *simple* or *specific*. Niemeyer regarded it as of a *diphtheritic* nature. So diverse have been the descriptions given of the morbid appearances, that it has been found necessary to start theories as to difference of type, &c., in order to explain the want of agreement, and it seems highly probable that the constitutional state of the patient will materially influence the pathological characters of the disease.

Usually only a portion of the *large bowel* is involved, especially the *rectum* and neighbouring part of the *colon*; sometimes the entire tract is affected, but the disease is then generally more advanced towards the

lower end of the intestine. Occasionally it extends into the small intestines, even for a considerable distance, but this is usually observed only in scorbutic cases; or when patients are much debilitated.

In the early stages the chief appearances are considerable enlargement of the solitary glands (which has been regarded by most authorities as the *primary lesion*), and of the tubular glands; increased vascularization, varying much in extent and intensity, but being especially marked around the glands; with some swelling and softening of the mucous membrane. The solitary glands form little rounded projections, and in many of them a minute spot can be detected, corresponding to the orifice. They are filled with a whitish exudation, containing abundant young cells. Some observers consider these prominences as at all events partly due to exudation outside the glands, and they affirm that these structures are not specially involved in dysentery. An exudation also forms in the intertubular tissues, and on the surface of the mucous membrane, which is of a diphtheritic nature. It covers the membrane more or less extensively and thickly, sometimes being uniform, but usually granular, often presenting an appearance like bran or sawdust, and being most abundant on the tops of the mucous folds. At first the colour is greyish or yellowish-grey, but this is soon liable to many alterations from various causes. The material is opaque, of some consistence, and can be detached, leaving a more or less red surface underneath, or the remains of extravasated blood. It appears to consist of a fibrinous substance, with abundant granules, nuclei, germs, epithelium cells, and young nucleated cells, some of which are elongated and fusiform, resulting mainly from proliferation. Occasionally the exudation undergoes a process of partial organization.

Ulceration appears to begin chiefly in connection with the enlarged glands, by a process of limited sloughing at the summit, the ulcer afterwards spreading. Sometimes, however, several glands, with the intervening tissues, are destroyed simultaneously,* or the ulceration appears to be due occasionally to a process of disintegration of the exudation, involving at the same time the superficial part of the membrane. Very rarely it originates in submucous accumulation of pus or other materials. At the outset most of, but not all, the ulcers are small, circular, with rounded edges; by extension they become larger and irregular, often having a transverse direction, the margins being flattened, and the depth and appearance of the surface varying greatly, so that in time the ulcers are altogether wanting in uniformity. Not unfrequently the floor becomes covered with exudation. Now and then the coats are rapidly destroyed, so as to lead to perforation. Should the disease terminate favourably, and cicatrization ensue, this generally takes place with little or no puckering, the edges becoming rounded and adhering to the base of the ulcer, a layer of lymph then extending over the surface, and becoming organized. Now and then healing is attended with much thickening, irregularity, induration, and contraction, leading to serious consequences. There is never any fresh formation of glands in the cicatrix.

The rapidity with which the changes just described take place in the course of a case of dysentery differs much. In very severe cases the entire mucous lining of the large intestine is speedily converted into a

slough. The affected part is generally dilated, and contains very offensive materials similar to those passed in the stools, including fragments of exudation, and often blood.

When the small intestines are implicated, the appearances which they present are redness; exudation on the surface, sometimes extensive; and enlargement, or, rarely, ulceration of Peyer's and the solitary glands. The stomach may be more or less inflamed. The other morbid conditions observed in different cases associated with dysentery are enlargement, redness, and softening of the mesocolic glands, and, in some forms, of the mesenteric; serous inflammations, especially peritonitis, either corresponding to the affected part of the bowel, or due to perforation; hepatic derangements, particularly inflammation ending in abscess; enlargement of the pancreas and spleen, the latter being in rare instances the seat of abscess; renal disease, with destruction of the epithelium; extensive bronchitis or lobular pneumonia; and pyæmic abscesses. The relation of *hepatic abscess* to *dysentery* has been much disputed. Some regard the two affections as merely two effects of the same cause, being independent of each other; others think that the abscess is secondary to the dysenteric ulceration, being produced by an extension of phlebitis to the liver, or, more probably, by the convection of emboli and other deleterious substances into the liver. This complication seems to be much more common in hot climates.

When dysentery becomes *chronic*, the appearances presented are very diverse. Usually firm exudation collects between the coats, matting them together, and causing much thickening and induration, so that the intestines feel very firm and solid, and pieces will sometimes stand on end. The colour of the mucous surface alters, becoming dirty brownish-grey, or in parts black, on account of pigment derived from altered blood. The exudation undergoes a certain degree of organization, and often forms thick, warty, adherent masses. The surface presents in some cases a bark-like aspect. Frequently, but by no means always, ulcers are observed, in every conceivable variety of stage and character, as well as cicatrices of former ulcers; some of these result from changes set up in the exudation, which extends into the tissue beneath. In some cases cicatricial bands and contractions alter greatly the calibre and form of the bowel, and sinuses may pervade its walls. In other instances there is extreme atrophy of the intestinal coats, including the glandular structures. An appearance of pseudo-ulceration may result from separation or cracking of the firm exudation, thus exposing the mucous surface, which is extremely red and irritable-looking.

SYMPTOMS.—**Acute dysentery** is presented in all grades of intensity, from a mild sporadic form to an epidemic of the most virulent type, but its symptoms are generally highly characteristic. Many cases, especially in temperate climates, commence with simple diarrhoea, slight colicky pains, thirst, loss of appetite, and some degree of constitutional disturbance, the special symptoms setting in after a short interval; sometimes, however, these are observed from the outset. A chill or rigor commonly ushers in the disease in severe cases.

The prominent *local* symptoms are griping pains in the abdomen,

technically named tormina, irregular in site, but chiefly felt along the colon; often a sense of heat or burning along the colon and rectum, or, in grave cases, over the whole abdomen; tenderness, especially in the left iliac fossa; more or less tympanitis; tenesmus, indicated by a sensation of fulness, weight, bearing-down, or of the presence of a foreign body about the lower end of the rectum, with frequent or constant desire to defæcate, the act being accompanied with much straining; and the passage of peculiar stools. The morbid sensations differ greatly in their severity and constancy; in most cases they are paroxysmal, increasing until a stool is passed, by which act they are temporarily relieved; sometimes, however, they become constant and most agonizing. The tenesmus is more marked when the lower portion of the rectum is implicated. At first the stools are often semi-fæculent, or consist of hard scybalæ, but they soon assume the dysenteric characters, becoming scanty, slimy or gelatinous from the presence of mucus, and bloody; also giving out a most offensive and characteristic odour. Usually the different matters are more or less mixed, the more so the higher the disease is situated, when the stools contain abundant depraved biliary secretions. If the rectum is chiefly affected, the blood is less intimately incorporated, while the stools are more muciform (Maclean). Not uncommonly scybalæ are passed from time to time, covered with mucus and blood. Mild cases do not go beyond this, but in grave forms of the disease, occurring in tropical countries, the stools change in their characters, becoming muddy-looking; brownish, brownish-red, or even black; often watery and copious; and containing shreds or masses of membrane, which look like "washed raw meat." Sometimes a large quantity of pure blood is passed; or sloughs of the mucous membrane are expelled. At this time the odour becomes intolerable, and it has been compared to carrion, or to the "smell of a macerating tub in the dissecting-room." Dr. Goodeve has recommended that the stools should be washed with water, so as to leave nothing behind but the sediment, which contains the products of the intestinal disease, and these can then be examined, the condition of the bowel being thus more accurately determined. Chemically the stools yield a large proportion of albumin, even when there is little or no visible blood. They are alkaline in reaction, and contain much carbonate of ammonia. Microscopically they present abundant epithelium cells, blood, exudation and pus cells, and remnants of the membrane. Peculiar cells and other bodies have also been described.

There are other indications of digestive disturbance, in the way of anorexia; thirst, which may be intense; furred tongue; and sometimes nausea and vomiting. There may be irritability of the bladder, with strangury; or, on the other hand, paralysis with retention when the rectum is much affected. The urine is generally high-coloured, scanty, and prone to rapid decomposition; in low forms it becomes very offensive; occasionally it is suppressed. In females irritation of the vagina is complained of in some cases of dysentery.

The *constitutional* symptoms in the less severe cases are only those indicative of slight pyrexia. In the graver forms these are more marked, there being at the same time much nervous depression and irritability, with an anxious, distressed expression of countenance. When a case

tends towards a fatal issue, or in the most severe types of the disease almost from the first, the symptoms assume an adynamic or typhoid character, with great prostration, the tongue becoming dry, red, brown, or blackish, with sordes on the teeth; the pulse being very rapid, feeble, or irregular; while the tympanitis increases; the painful sensations cease; there is persistent hiccup; and low nervous symptoms set in, ending in coma. In the *malignant* type of dysentery speedy collapse occurs, resembling that of cholera; accompanied with hæmorrhage from the mouth and nose.

VARIETIES.—Several varieties of acute dysentery have been described, according to the severity and nature of the symptoms present, and the conditions with which the disease is associated. The chief are named:—

1. **Mild.** 2. **Sthenic.** 3. **Asthenic** or **Typhoid.** 4. **Bilious.** 5. **Malarious**, characterized by the periodicity of the febrile paroxysms, much gastric irritability, the serous character of the stools from the first, which contain but little blood, the greater frequency of hepatic complications, and the efficiency of quinine in treatment (Maclean). 6. **Malignant.** 7. **Scorbutic.**

DURATION AND TERMINATIONS.—Dysentery lasts a very variable time, and it may terminate in death or recovery; or may become chronic. Death may happen within two days, or not for two or three weeks or more. This event results either from collapse; the typhoid state; gradual exhaustion in prolonged cases; hæmorrhage; or occasionally from perforation. A favourable turn is indicated by the stools becoming fæculent and losing their dysenteric characters; the cessation of the painful sensations; diminution of fever; and improvement in strength, in the state of the pulse, and in the expression of the face.

Chronic Dysentery is a most troublesome complaint, but the precise symptoms do not entirely depend upon the state of the bowels, being often modified by some constitutional diathesis, or by a diseased condition of some other organ. The tenesmus and other morbid sensations are less marked than in the acute form, or they may be absent. In some cases control over the sphincter ani becomes completely lost. The stools differ considerably in their characters, even in the same case, from time to time. They may be formed, but covered with mucus or blood; usually, however, they are more or less liquid, presenting a mucous, serous, or bloody appearance, with an admixture of fæces; sometimes they are either reddish-brown, pale and frothy, muco-purulent, or actually purulent. The peculiar odour is retained more or less, and may be very intense. Appetite varies much, but is usually impaired; the tongue is often red, glazed, or fissured. The general system necessarily suffers considerably in marked cases, as evidenced by emaciation; anæmia, or a sallow and cachectic aspect; shrunk features, with a distressed, weary, or aged expression; a sense of weakness and exhaustion; pyrexia, tending towards the hectic type, with night sweats; and loss of hair. Death often results from gradual asthenia.

DIAGNOSIS.—The symptoms of dysentery just described are quite characteristic, and an examination of the stools, combined with the sensations of the patient, and the general symptoms, ought to leave no doubt as to the nature of the disease. All authorities lay much stress upon the peculiar odour of the evacuations. The fact of the disease

being epidemic may also be of service in diagnosis. Dysenteric symptoms may set in in cases of long-continued intestinal catarrh, which might then be mistaken for true dysentery. I have also known a case of cancer of the rectum simulate chronic dysentery.

PROGNOSIS.—The prognosis of *acute dysentery* will depend upon whether the disease is sporadic or epidemic; the severity of the attack; the characters of the stools; the general condition of the patient; the progress of the case; and the presence or absence of serious complications, especially hepatic abscess. Epidemic dysentery, particularly when of a low type, is extremely fatal. Signs of collapse or adynamia are of course very unfavourable, and among specially bad signs are mentioned gangrenous stools; severe hæmorrhage; subsidence of the pain, while the other symptoms are becoming worse; and suppression of urine. An early return of the evacuations to their normal state is highly favourable. *Chronic dysentery* may often be improved by appropriate management, as I found from a tolerably extensive experience of this disease at the Liverpool Northern Hospital. Prolonged cases, however, are not much amenable to any treatment.

TREATMENT.—Early attention is of extreme importance in *acute dysentery*, and the patient should immediately take to bed. In the sporadic form resulting from a chill, some authorities advocate the use of a warm, vapour, or hot-air bath at the outset. In some cases also a small dose of castor oil with laudanum is beneficial at first. *The remedy*, however, in this disease, and one which seems to have almost a specific action, is ipecacuanha in full doses. Several gentlemen who have had much experience in the treatment of dysentery in India, have personally informed me of the marvellous effects of this drug. Dr. Maclean recommends the following plan of administration:—To give gr. 25 to 30 of the powder in a small quantity of fluid, with a little syrup of orange-peel, after which the patient must keep perfectly quiet, and take no fluid for at least three hours, if thirsty being allowed to suck a little ice occasionally. In from eight to ten hours a smaller dose may be given, this depending on the effect of the first, and the urgency of the symptoms, by which also the subsequent repetition of the drug must be guided, and it may be required for some days. It is well to administer 10 or 12 grains at bed-time for a night or two after the stools appear healthy. Some authorities recommend the ipecacuanha to be administered more frequently in smaller quantities; and others employ $3\frac{1}{2}$ to 3j every four or five hours, but these large doses seem unnecessary, and are liable to produce much depression. It has also been advocated to introduce the drug by enema, but this is likewise objectionable. Many consider it desirable to make the stomach tolerant of the medicine beforehand, by giving a full dose of laudanum or Battley's solution, or a few drops of chloroform; or by applying anodyne poultices over the epigastrium. Perhaps a small subcutaneous injection of morphia might answer this purpose. Dr. Maclean states, however, that frequently no sedative is required, and that if vomiting is unmanageable after ipecacuanha, hepatic complication or overcharging of the system with malaria should be suspected.

Local applications over the abdomen are very useful, especially warm poultices; fomentations sprinkled with turpentine, laudanum, or chloro-

form; and sinapisms. *Symptomatic treatment* is often required. The above applications will usually afford relief to the painful sensations, but if the tenesmus is very severe, warm emollient enemata, or a suppository of opium may be tried. Of course *diet* requires the utmost attention. Beef-tea, soups, arrowroot, sago, raw white of egg, jellies, and such articles should be given in small quantities, between the periods of administration of the ipecacuanha. *Stimulants* are to be avoided generally, but in the typhoid condition they are certainly required. As the patient improves, so must the food be cautiously altered. *Hygienic measures* also demand every care, especially as regards the immediate *disinfection* and *destruction* of the evacuations.

The evidence in favour of the treatment thus far considered seems quite conclusive; but in a treatise of this kind it is necessary to mention the other chief methods advocated. These are:—1. By *astringents*, especially opium. These are useful if diarrhoea holds on after the stools have lost their dysenteric characters. 2. By *purgatives*, such as castor oil, sulphate of magnesia, or cream of tartar. 3. By venesection and calomel. Calomel has been given in large quantities; or in doses of gr. i to gr. ij with opium every three or four hours. This treatment had better be avoided, and the only removal of blood which seems justifiable is by the application of a few leeches in the left iliac fossa, should the pain be very intense, and the state of the patient be favourable. 4. By a combination of blue pill, opium, and ipecacuanha. 5. By *antiseptics*. 6. By large doses of tincture of steel. It is important to note that there are two forms of dysentery which require a modification of treatment, namely, the *malarious*; and the *scorbutic*. The former calls for full doses of quinine, alternating with the ipecacuanha; the latter demands fresh fruits, and Maclean and others recommend bael very highly in these cases.

In the management of **chronic dysentery** the most essential matters are to regulate the *diet*; and to attend to *sanitary measures*, with the view of improving the health. Dr. Harry Leach found from his experience at the Dreadnought Hospital, that rest for the bowels and body, with a bland nutritious diet, are mainly to be relied upon for a cure, and he considers that drugs are of little or no use. Certainly I think that I have seen much benefit follow the administration of Dover's powder, gr. iv—v three or four times daily; and still more from full doses of tincture of steel during the day, with a little Dover's powder night and morning. Dr. Reginald Thompson found ipecacuanha (gr. iij—v every three hours) most serviceable. The stronger *astringents*, such as gallic acid, acetate of lead, sulphate of copper, or nitrate of silver are often employed, but they have never been of much permanent service in my experience. Small doses of bichloride of mercury have also been recommended. A dose of castor oil with a little opium may be taken from time to time. Enemata containing opium are sometimes beneficial, especially for relieving unpleasant sensations. Other measures recommended for this purpose are the use of a water compress over the anus, or gentle douching of this part; wearing a bandage or a water-belt over the abdomen; friction over the abdomen with anodyne or irritant liniments; or the application of a blister over the left iliac fossa. Among the *hygienic* matters needing special attention are change of air,

particularly speedy removal from a malarial district, or from a tropical country to Europe ; the wearing of warm clothing ; and the use of cold baths, followed by friction, if they are well borne. Some practitioners employ baths containing dilute nitro-hydrochloric acid. If there is any malarial, scorbutic, or other morbid condition of the system, the treatment must be modified accordingly. Any acute or sub-acute exacerbation of symptoms calls for complete rest ; and the immediate administration of ipecacuanha.

CHAPTER XXII.

INTESTINAL NEW FORMATIONS AND ULCERATIONS.

It appears desirable to give a summary of the morbid conditions which come under the above headings, with some general remarks on their clinical features ; and to consider briefly such of the more important of these conditions as have not yet been noticed. It is expedient to treat of *new formations* and *ulcerations* together, because the former often originate the latter.

I. GENERAL SUMMARY.

A. NEW FORMATIONS.—These include :—1. *Cancer*. 2. *Tubercle* and other materials formed in the so-called *tubercular disease*. 3. *Typhoid deposit*. 4. *Albuminoid material*. 5. Occasionally *fibroid infiltration*. 6. Rarely *villous growths* ; *polypi* ; *adipose*, *cystic*, *erectile*, or *glandular tumours* ; and *calcareous deposits*. The *local* symptoms due to either of these formations, should any be present, are either indicative of obstruction of the bowel ; or of irritation and catarrh of its mucous membrane. Local pain or tenderness may or may not be complained of. Frequently there are constitutional symptoms, or symptoms associated with other organs, which aid in determining the nature of the disease. In some cases *physical examination* may detect a growth.

B. ULCERATIONS.—Intestinal ulcers may be thus arranged :—

I. **Non-specific.** These comprise :—1. Ulcers due to *direct injury* of the mucous surface by foreign bodies, calculi, hardened fæces, and chemical destructive agents, including probably acrid secretions. 2. Those originating in *inflammation*. Simple catarrh, especially if it be of long duration, may end in ulceration, either catarrhal or follicular. The separation of croupous or diphtheritic deposit may also originate an ulcer. Rarely this lesion results from submucous suppuration or gangrene. 3. *Perforating ulcer*. An ulcer similar to the gastric variety is now and then observed in the duodenum. The form associated with burns and scalds also needs to be mentioned. 4. Ulceration due to some *morbid condition outside the bowel* making its way into the interior, which is very rare.

II. **Specific.** These comprehend :—1. *Typhoid*. 2. *Tubercular*.

3. *Dysenteric.* 4. *Cancerous.* 5. *Syphilitic* probably. 6. Ulcers due to *albuminoid disease.*

SYMPTOMS.—The *local* symptoms suggestive of ulceration of the bowels are frequent colicky pains; localized tenderness, especially if the disease is extensive, or if the large intestine is involved; and persistent diarrhoea, the stools often presenting very unhealthy characters, sometimes resembling pea-soup or gruel, and being unusually foetid, or containing blood, mucus, or pus. Cases come under observation, however, in which constipation is a conspicuous symptom. If the disease is limited to the small intestines, especially their upper part, diarrhoea is of a simple kind; and it is usually only in such a case that constipation is observed. If the large bowel is much implicated, especially the rectum, the symptoms tend to assume a dysenteric character. The diarrhoea is chiefly due to enteric catarrh set up by the ulceration. The circumstances under which ulceration occurs will generally aid materially in indicating this event, as in typhoid fever, dysentery, or phthisis. When *chronic*, it is in some instances very difficult to make out positively that there is ulceration, and to distinguish this lesion from mere chronic catarrh, but it may be strongly suspected should there be diarrhoea, either constant or easily excited, or not amenable to treatment, especially if the stools are of a very unhealthy character. The constitutional condition often affords aid in diagnosis. Intestinal ulceration itself tends to excite more or less pyrexia, which in chronic cases is frequently of a hectic type; and it also leads to impaired nutrition, consequently inducing emaciation, debility, and anæmia. It may cause peritonitis, perforation, or serious hæmorrhage; or stricture may result from cicatrization.

TREATMENT.—It need scarcely be remarked that attention to *diet* is all-important in treating ulceration of the bowels. At the same time it must be so ordered as to promote the nutrition of the patient; and to be adapted for any morbid diathesis present. Rest of the body is highly beneficial; and of course the affected part should be kept as quiet as possible. This object is best gained by administering opium in some form, if it is admissible; if not, other *sedatives* must be given, especially belladonna. Diarrhoea must be controlled by the various *astringents*, along with opium. The chief remedies which are believed directly to promote the healing of ulcers are nitrate of silver, sulphate of copper, acetate of lead, oxide of zinc, and bismuth salts. Much benefit often follows the use of carbonate of bismuth with Dover's powder in the ulceration which occurs during phthisis; as well as in other forms. It is not desirable to encourage long-continued constipation, but should this symptom be present, much care is necessary in the employment of aperients, which must be of the mildest kind; simple enemata are very useful under these circumstances. *Tonics* are often indicated, especially preparations of iron. It is well for the patient to wear a warm bandage round the abdomen, properly applied. *Local applications* may be required from time to time. Some recommend an occasional blister over the right iliac fossa, or other forms of counter-irritation.

II. CANCER OF THE INTESTINES.

ANATOMICAL CHARACTERS.—Primary cancer of the intestines is very rare, and when the bowel is involved, which is not a common event, it is generally by extension of the disease, especially from the peritoneum and sub-peritoneal tissue, though even then the muscular and mucous coats often escape. The large intestines, particularly the rectum and sigmoid flexure, are far more frequently attacked than the small, of which the duodenum is the part usually implicated. All varieties of cancer are met with, even melanosis, but scirrhus is the ordinary form. Epithelioma has in rare instances invaded the rectum by extension from the uterus and vagina. Sometimes encephaloid grows on a basis of scirrhus, when the latter reaches the interior of the bowel.

The usual variations are presented as to the characters, arrangement, and extent of the cancer. It may be limited to one part, occasionally forming a rounded or lobulated tumour; widely spread; or disposed in scattered nodules, which are often secondary to some more localized and extensive deposit. In the progress of the disease the coats become matted together, and ultimately, if the mucous membrane is implicated, ulceration or sloughing ensues, the ulcer being either smooth and excavated, with thickened, indurated, and tolerably regular edges; or presenting an irregular aspect, with fungous growths over the floor and margins, which are often very vascular, and liable to bleed freely. Perforation may take place, not uncommonly a communication being thus established with some hollow organ. Frequently the affected part of the intestine is much constricted; while the part above is dilated, and its muscular coat hypertrophied, the portion beyond being contracted.

SYMPTOMS.—The following are the clinical phenomena to be looked for as indicative of cancer of the bowels:—1. Localized pain in some part of the abdomen, either constant or paroxysmal in character, dull and aching or lancinating, and accompanied with local tenderness. 2. Habitual constipation, with abnormal shape and size of the stools, ultimately culminating in complete obstruction. 3. The *physical signs* of a tumour situated deep in the abdomen; hard and irregular; tender on pressure; at first movable, but afterwards becoming fixed. 4. Marked and rapid wasting and loss of strength, often accompanied with signs of the cancerous cachexia, or of cancer in other parts. In some instances there is diarrhoea, especially after ulceration sets in, when the stools become extremely offensive, and occasionally symptoms of obstruction disappear, owing to a mass of cancer sloughing or ulcerating away. When the rectum is affected, the pain is referred to the sacrum, shooting thence towards the thighs and back, and being often extremely severe. There may likewise be intolerable irritation and itching within the anus. Symptoms of a dysenteric character are also generally complained of. Examination *per rectum* will usually reveal the disease. Cancer is liable to give rise to profuse hæmorrhage; or it may lead to intestinal perforation, or to extensive destruction of neighbouring organs. Death occurs gradually as a rule, but may be hastened by complete intestinal obstruction; perforation; peritonitis; or hæmorrhage.

TREATMENT.—In the large majority of cases of intestinal cancer all that can be done is to treat symptoms. In some instances life may be prolonged, and symptoms greatly relieved, by making an artificial opening into the bowel above the seat of the disease, should this be low down.

III. TUBERCLE OF THE INTESTINES—TUBERCULAR ULCERATION—SCROFULOUS DISEASE OF THE INTESTINES.

ÆTIOLOGY AND PATHOLOGY.—There are the same differences of opinion as to the pathology of the so-called *tubercular* disease and ulceration of the intestines, as in the case of other affections of this class. Some pathologists explain all the phenomena by the formation of tubercle, and its subsequent destruction, along with the involved tissues. Others consider that true tubercle is but rarely formed, and that the morbid process usually consists in the proliferation of cells in the glands, which become caseous and break down, ultimately destroying the over-lying membrane, and forming ulcers, which spread by further cell-formation, and disintegration of the surrounding mucous and submucous tissues. Niemeyer acknowledged that *secondary tubercle* is met with sometimes in the immediate vicinity of ulcers, especially in the peritoneum corresponding to these lesions, but he maintained that as a primary condition intestinal tubercle is extremely rare.

It certainly is most difficult to distinguish definitely tubercle in the intestines. Niemeyer stated that it would be best recognized by its being deposited in separate nodules or groups, in parts where Peyer's patches do not exist.

As a *local* affection, implicating at the same time the mesenteric glands, this complaint is by far most frequent in scrofulous children; in adults it rarely occurs except as a complication of pulmonary phthisis.

ANATOMICAL CHARACTERS.—In the great majority of cases the solitary and Peyer's glands are chiefly implicated, and hence the morbid appearances are observed in the lower portion of the small intestines, or are most advanced in this part, while they gradually cease towards the jejunum. Occasionally they extend into this portion of the bowel, or very rarely even to the duodenum. Not uncommonly the cæcum, appendix vermiformis, and colon are involved, to which parts the disease is sometimes chiefly or even entirely limited. The area affected varies greatly, and generally the morbid changes are visible in different stages in different parts. At first little firm, grey, projecting nodules are seen, which become yellow, and soften and break down, producing small circular ulcers. Apart from their situation, it appears impossible to distinguish the granulations of tubercle from those due to enlarged glands. The ulcers soon become larger, however, either by infiltration and destruction around, this process invading tissues far beyond the glands; or by coalescence. In course of time they come to present special characters, in which condition they are generally seen at *post-mortem* examinations. These characters are, more or less irregularity in shape; a transverse direction as regards the bowel, the ulcer spreading mainly in the course of the vessels, and sometimes completely surrounding the gut with a band of ulceration $\frac{1}{2}$ to 1 inch or more in

width ; thickening, irregularity, and induration of the margins and floor, the latter presenting nodules ; and but little proneness to heal. Imperfect or partial cicatrization is, however, often observed, with the formation of a dense tissue, sometimes pigmented, the edges of the ulcer being drawn together, contraction and irregularity of the gut being thus produced, or in rare instances even complete stricture.

During the process of ulceration, *local peritonitis* is set up, giving rise to thickening and adhesion, and thus all the coats of the bowel are frequently destroyed without the occurrence of any symptoms of perforation, or sometimes a communication is formed between two portions of the intestines. *Secondary tubercles* are often observed in the affected portion of the peritoneum, which may spread along the lymphatics to the mesentery. The floor of an ulcer not uncommonly presents evidences of hæmorrhage. Niemeyer affirmed that true tubercular ulcers are not so extensive as those of non-tubercular origin.

SYMPTOMS.—Tubercular disease of the bowels is indicated in the child by the persistent or frequent occurrence of symptoms of intestinal irritation and catarrh ; associated with the general signs of tuberculosis, marked wasting, and retarded development. In the adult ulceration may be suspected if in the course of phthisis the symptoms characteristic of this lesion should arise ; especially if diarrhœa sets in, which will not yield to appropriate treatment, and if there is localized tenderness. It is in this class of cases, however, that constipation is most frequently observed, being sometimes due to peritonitis ; while, on the other hand, it must be remembered that diarrhœa is often dependent upon other causes.

TREATMENT has been sufficiently indicated when discussing the treatment of intestinal ulceration in general.

IV. ALBUMINOID DISEASE.

ANATOMICAL CHARACTERS.—The entire alimentary canal may become the seat of albuminoid disease, and it will suffice to offer a few general remarks on this subject. In the intestines the change begins in the small vessels of the villi, and then spreads to the larger vessels ; in course of time it involves the glands, the entire villi, and ultimately the whole of the mucous coat, or even the submucous and muscular coats. Extensive atrophy of the villi may follow. The morbid material is liable to undergo disintegration, being changed into a yellow substance ; and finally small ulcers are sometimes formed, corresponding to the glands. It is very difficult in the early stages to recognize albuminoid disease of the alimentary canal. The mucous surface appears pale, anæmic, and glistening or shining, but the iodine test is necessary to reveal the change, which shows that it affects the villi and small vessels. In more advanced cases the appearances are more characteristic, and enlarged glands or ulcers are seen, especially corresponding to Peyer's or the solitary glands. Peyer's patches sometimes present a reticulated aspect.

SYMPTOMS.—Should there be signs of albuminoid disease of other

organs, implication of the alimentary canal may be fairly diagnosed if obstinate diarrhoea should set in, with liquid stools, especially if these are greenish, or in other respects of an unhealthy character. Hæmorrhage is liable to occur in the later stages, and it may be quite independent of ulceration. Implication of the stomach is indicated by persistent vomiting; with signs of imperfect digestion. When the alimentary canal is affected with albuminoid disease, the general nutrition is necessarily gravely interfered with.

TREATMENT.—The treatment is that indicated for albuminoid disease in general; and for gastric or intestinal catarrh or ulceration.

CHAPTER XXIII.

INTESTINAL OBSTRUCTION.

ÆTIOLOGY AND PATHOLOGY.—The numerous causes of obstruction of the bowels may be ranged under certain heads, viz. :—

1. **Accumulations in their interior**, including hard fæces; indigestible matters, either taken in the food, such as oat-cakes, rice, seeds or stones of fruits, or swallowed purposely, especially by hysterical girls and children, *e.g.*, string, hair, dirt, sand; certain medicines which are apt to form concretions if taken for some time in considerable quantity, namely, magnesia and sesquioxide of iron; masses of worms; large or numerous and agglomerated gall-stones; concretions of phosphate or carbonate of lime. Gall-stones usually lodge high up in the small intestines.

2. **Stricture** resulting from morbid changes in the coats of the bowels, including :—*a. Congenital constriction*, usually situated about the anus, rarely in the duodenum. *b. Cicatrization of an ulcer*, especially if this has passed round the gut, or if it has been very extensive. *c. Fibroid infiltration* of the walls. *d. Cancer*. This class of causes is by far most common in connection with the large intestines.

3. **Compression, constriction, or traction**, due to morbid conditions external to the intestines. Dr. Hilton Fagge has drawn particular attention to some of these causes, which include pressure by displaced or enlarged organs and tumours of various kinds, particularly in connection with the uterus and ovaries; by growths or accumulations in the intestine itself; or by certain adhesions, agglutinations, or deposits in the peritoneum, sometimes after simple peritonitis, but more frequently associated with tubercle or cancer. The last-mentioned may lead to distinct constriction, or may cause a sudden bend or twist in the intestines; but usually they merely impede the peristaltic action; either by compressing the bowel somewhat for a considerable extent, binding it down, exerting traction upon it, or matting together several of its coils. Hence materials collect above, which press upon the portion below, ultimately inducing complete obstruction; this being fre-

quently aided by a certain degree of spasm. These causes mainly affect the small intestines.

4. **Strangulation** or **incarceration**, either **external** or **internal**. Under this group come the different forms of *hernia*, the rarer varieties of which must not be forgotten. *Internal strangulation* results in rare instances from the passage of a portion of intestine into some normal opening, especially the foramen of Winslow; or into a perforation in one of the folds of the peritoneum, for example, the omentum or mesentery. Generally, however, it is due to peritoneal bands of adhesion passing between different parts; or to the vermiform appendix, or diverticula connected with the ileum, becoming adherent at their free ends. Very exceptionally one portion of the bowel is strangulated by another portion; by the mesentery; or by its entrance into a rupture in the intestine or some other hollow viscus.

5. **Altered relation** of portions of the bowel, or of the intestinal coats. The most important form of obstruction coming under this head is that named *intus-susception*, *invagination*, or *volvulus*, in which one portion of the intestine is prolapsed into that next below. Another variety is named *torsion* or *rotation*, in which the bowel with its attached mesentery is twisted, though Dr. Bristowe considers that this twisting is in many cases not the cause of obstruction, but the effect of enteritis, which has been the primary mischief. *Prolapsus ani* also falls within this group, though it scarcely ever leads to complete obstruction. As very rare conditions have been mentioned *sacculation* of a part of the bowel; and *hernia of the mucous membrane* through the other coats.

5. **Spasm** and **paralysis** of the muscular coat. Either of these conditions may aid in inducing obstruction; or now and then it may possibly be the sole cause.

With regard to the *determining cause* of *intus-susception* a few remarks are necessary. This depends upon the peristaltic action of the intestines, and is supposed to be chiefly the consequence of undue dilatation of a portion of bowel towards which the wave of contraction is advancing, from accumulation of gas or any other cause; and to this portion being fixed, so that the part above is driven into it by the force of its own contraction. In many cases some violent exertion, in which the muscles of the abdominal walls partake, determines the occurrence of *intus-susception*. It has also been stated to be originated by worms or polypi; and to arise frequently in connection with chronic diarrhoea. Once it has started, the *invagination* increases by a continuance of the peristaltic action, by which more bowel is driven in from above, at the same time the outer tube of intestine being inverted. Some of the other forms of sudden obstruction may also be immediately caused by violent effort.

Sex and age require notice as constituting important *predisposing causes* of certain varieties of obstruction. That resulting from impaction of gall-stones is by far more frequent late in life, and in females. Strictures are more common in males, and after middle life. Internal strangulation does not often occur under 30 years of age, except that form due to adhesions of the appendix vermiformis or of diverticula, which is observed in young persons most frequently, and chiefly in males. Ileo-cæcal *intus-susception* is remarkable for its frequency in

children, but when it affects the ileum or jejunum it is almost limited to adults; on the whole intus-susception is twice more common among males than females.

ANATOMICAL CHARACTERS.—The appearances met with after death in cases of intestinal obstruction necessarily vary much according to the condition upon which it depends. *Intus-susception* is the only form which calls for special description. By far the most common form of invagination is that in which the *ileo-cæcal orifice descends into the cæcum*, and then passes on into the colon, bringing down more and more of the ileum. The condition is not very uncommon in the ileum or colon, but is rarely observed in the jejunum or rectum. Very exceptionally the end of the ileum passes *through* the ileo-cæcal opening, the lips of the latter not being displaced. The portion of intestine which is the seat of invagination presents three layers, arranged concentrically in the following manner:—The most internal layer is the part which has descended, or the *intus-suscepted portion* or *volvulus*; the outer one is the *sheath* or *intus-susciptiens*; and the middle layer unites these two portions, being derived from the continued involution of the sheath, and its surfaces are necessarily reversed, so that its serous coat is in contact with that of the internal layer, and its mucous coat with that of the external, while the mesentery belonging to the middle and external layers is drawn in, and lies between them. This exercises unilateral traction, whereby the intus-suscepted portion is curved, with the concavity towards the involved mesentery, while its lower opening looks towards some part of the wall of the outer tube, being elongated and fissure-like. The part of the intestine which forms the volvulus is more or less convoluted or twisted, especially the middle layer.

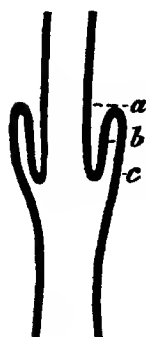


FIG. 3.*

The extent of the invagination varies considerably, ranging from an inch or two to three or four feet or even much more than this, especially in the ileo-cæcal variety. Not uncommonly short intus-susceptions are found in the small intestine after death, which are easily reduced, and which have given rise to no symptoms during life; it is probable that these are originated during the act of dying, or even post-mortem. In the great majority of cases, whatever the length of the intus-suscepted portion may be, its lower end continues the same as at the commencement. Ultimately it may reach the anus, or even protrude through this opening.

Certain important events are liable to happen in connection with the invaginated portion of intestine. 1. Of course the inner layers are more or less *compressed* by the outer tube, especially at the entrance or neck of the invagination; the canal is therefore narrowed, though not usually completely closed at first. 2. The return of blood is interfered with, and hence *mechanical congestion* is induced, often intense, leading to œdema of the tissues, or even to the escape of blood between the mucous surfaces or into the intestinal canal, where it is mixed with serum; consequently thickening and swelling arise, which increase the

* Diagram of Intus-susception :—a. Volvulus; b. Middle layer; c. Sheath.

obstruction. 3. Soon *peritonitis* is set up in the contiguous layers of the serous coat, with exudation of lymph, and this may spread and become general; or the formation of adhesions may prevent any further descent of the intestine. 4. Violent *enteritis* is excited, and ultimately, owing to this condition being added to the congestion, *gangrene* not uncommonly results. 5. In some cases the mortified portion becomes *detached*, either completely or in part, and either in one mass or in fragments, and is *expelled per anum*. The dangers of this separation may be prevented by adhesions having formed between the top of the outer tube and the intestine above; but if these are not sufficiently firm, the structures give way, and the intestinal contents escape into the peritoneum. If the bowel is expelled and adhesions are complete, recovery may follow, but there is still a further danger of a stricture forming at the point of union; or sometimes only a part of the invaginated bowel comes away, while the upper portion remains and becomes adherent to the surrounding tube, and thus more or less permanent obstruction is established. The rapidity with which the changes above described are set up depends on the force of the compression, and therefore upon the part of the bowel which is involved. They are much more rapid in connection with the small intestines than the large, but are peculiarly speedy when the ileum passes through the ileo-cæcal orifice without disturbing it.

The portion of intestine above that which is intus-suscepted acts with undue vigour, and thus aggravates the mischief, while at the same time it drives on some of the contents of the bowel. For a time also the affected part itself contracts. By the pressure of its lower end against the wall of the outer sheath, ulceration of the mucous surface is often set up. In very rare instances double intus-susception has been observed.

Any sudden or acute intestinal constriction will necessarily lead to congestion of the bowel and its consequences; inflammation, involving also the peritoneum; and ultimately to gangrene and perforation, if the constriction is not relieved. In prolonged and chronic cases the part of intestine above an obstruction becomes much dilated, elongated, and hypertrophied, though these appearances are not always most marked directly above the impediment; while fæces and other matters accumulate, giving rise to catarrh or ulceration. The distal portion becomes contracted, empty, and atrophied.

SYMPTOMS.—The direct clinical phenomena which in the first instance indicate complete obstruction of the bowel, from whatever cause, may be stated generally as absolute constipation, usually accompanied with colicky pains, often severe; increased peristaltic movements of the intestines; abundant formation with accumulation of gas, leading to tympanitis and borborygmi; nausea and vomiting, the latter ultimately becoming stercoraceous or fæcal. Not uncommonly *physical examination* of the abdomen and rectum reveals some abnormal condition. In many cases symptoms indicative of severe enteritis, peritonitis, or perforation are subsequently developed.

There are certain circumstances which have an important influence on the clinical history of intestinal obstruction, the most important being the pathological condition to which it is due; and its seat. Prac-

tically cases may be divided into two classes, viz. :—1. Those in which the obstruction is established *gradually*. 2. Those in which it occurs *suddenly* or *acutely*. In the former class of cases there will be a history of constipation, sometimes alternating with diarrhoea, and often accompanied with alteration in the shape and size of the solid stools; colicky pains; nausea and vomiting from time to time, and other digestive disturbances; with perhaps occasional signs indicating complete temporary closure of the bowels. *Physical examination* may reveal some mechanical obstruction. These cases either terminate slowly by asthenia; or they culminate in a sudden attack of absolute stoppage of the bowels. The pain associated with intestinal obstruction is at first of a griping character, in some forms being sudden and severe, frequently starting from about the umbilicus, but it may radiate from some other locality which corresponds with the seat of the disease; after a time peritonitic pain not uncommonly supervenes. Absolute constipation is not an invariable symptom, for when the small intestine is implicated, its liquid contents are able to pass along the canal unless there is complete closure, and the same thing may happen when intus-susception affects the large intestine; further, fæces contained in the bowel below an obstruction are often expelled. Occasionally blood and mucus are discharged, especially in cases of invagination of the large bowel. Vomiting is more easily excited, and is more severe, the nearer the stoppage approaches to the stomach. At first it is sympathetic in most cases, but soon the rejected matters have a distinctly faecal odour, and present an appearance like pea-soup, consisting of materials which have either flowed back into the stomach from the bowels, or been forced through the pylorus by anti-peristaltic action, or by external pressure. In some instances there is more or less suppression of urine, especially if the obstruction is situated high up, this being most probably a sympathetic derangement.

DIAGNOSIS.—The further elucidation of the clinical history of these cases will be best aided by considering the points on which a diagnosis is founded. This has to determine, first, the fact of the *existence* of an obstruction and its *cause*; and, secondly, its *situation*.

In conducting the examination the following course may be adopted :—1. The *age* and *sex* should be noted, their influence as predisposing causes of different varieties of obstruction being borne in mind. 2. Certain matters in the *past history* of the patient should be specially enquired into, namely, whether articles have been taken, either in the food or in any other way, which might form concretions in the intestines; the habitual state of the bowels; and if there is any history of previous intestinal ulceration, peritonitis, the passage of gall-stones, or of uterine displacement or any other condition which might give rise to pressure. 3. Any peculiar *constitutional condition* must be observed, and this may afford some aid, as, for instance, by indicating the cancerous cachexia: or the existence of phthisis, which is liable to be attended with ulceration and its consequences, or with tubercular peritonitis; or of chronic dysentery; or of hysteria, in connection with which accumulations of fæces are common, and possibly paralysis might occur. 4. As regards the *history of the attack* itself, it should be first ascertained whether the obstruction has been gradual or sudden in its onset; and how long it has lasted. If it has been chronic,

enquiry must be made as to what the state of the bowels has been; if any peculiar alterations in the stools have been observed; or if there have been previous attacks of complete obstruction, which have yielded to treatment. Should the obstruction be acute, it must be ascertained whether the attack can be traced to anything having been swallowed, or to any sudden effort or other cause; and if it has commenced with severe localized pain. 5. The precise *local* and *general* symptoms must of course be carefully noted, whether as indicating simple obstruction, partial or complete; or, in addition, enteritis or peritonitis; and also the rapidity with which stercoraceous vomiting sets in. 6. Careful *physical examination* is essential, in conducting which attention should be paid to the following particulars:—*a.* All forms of *hernia* must be thoroughly searched for. *b.* Any *contraction* or *distension of the abdomen*, either general or local, must be noted, a view being also taken from behind; in the early stages this may help materially in fixing upon the seat of any obstruction. *c.* The situation may also be partly determined in some cases by observing the site of any *violent peristaltic movements* in the intestines. *d.* Among the more important conditions discoverable by satisfactory exploration of the abdomen, which may also point to the situation of a stricture, are *accumulations*, not forgetting impacted gall-stones, the onward progress of which can occasionally be traced; *tumours* of various kinds, either external to, or associated with the intestines; and *intus-susception*. It must be remarked, however, that even when these conditions exist, it is for many reasons frequently difficult or impossible to detect them. *e.* *Examination per rectum*, by means of the finger, hand, or bougie is often most serviceable. The amount of fluid or air which can be injected *per anum* has been stated, especially by the late Dr. Brinton, to aid materially in fixing upon the seat of any stoppage, but this must be by no means implicitly relied upon. *f.* Of course, should anything be *vomited* or *passed by stool*, the materials thus discharged should be properly examined. 7. In any doubtful case, it is necessary to *watch its progress* as regards its clinical course, rapidity, and termination, which may speedily afford considerable assistance in diagnosis.

Having given this general outline of the method of investigation to be pursued, it will be well to add a brief summary of the chief clinical features presented by each class of cases of intestinal obstruction.

1. **Accumulations** are generally gradual in their progress, but in some instances, especially when due to gall-stones, the symptoms come on very suddenly. The physical signs and consequences of most of these collections have been already considered in a former chapter; and here it need only be remarked that impacted gall-stones are particularly liable to set up violent enteritis, while the course of these cases is usually very rapid.

2. **Strictures and compressions** of the bowel may be considered together. They are usually chronic in their progress, complete obstruction being preceded by gradually increasing constipation, sometimes interrupted by attacks of diarrhoea; diminution in the size and change in the shape of the stools, should a stricture be seated near the lower end of the intestines; liability to colicky pains, sickness, and other digestive disturbances; and interference with nutrition. From time to

time also there may be signs of temporary complete obstruction. There may be a history of some cause of stricture or compression; or *physical signs* may be detected, indicating some morbid condition likely to give rise to either of these mishaps. Commonly these cases linger on for a long while, even after absolute closure of the bowel has been established. Now and then, however, signs of obstruction come on suddenly, without any particular previous signs, these being followed by enteritis or peritonitis. Possibly some accumulation above the stricture may then be the immediate cause of the symptoms.

3. **Strangulations** give rise to rapid and absolute obstruction; followed speedily by signs of severe enteritis, or even of gangrene of the intestines, perforation, and peritonitis. If not relieved, their issue is quickly fatal. Many cases belonging to this class can only be determined by exclusion, and frequently they can merely be guessed at. A previous history of peritonitis may help the diagnosis; while the immediate attack is often due to some violent exertion.

4. **Intus-susception** is also sudden in its onset as a rule, beginning with griping pain, more or less violent, usually referred to the umbilical region. Subsequently colicky pains occur from time to time, and the ordinary signs of obstruction set in, followed by those of enteritis or peritonitis. The other important diagnostic evidences of invagination are the *passage of blood per anum*, in some cases mixed with mucus or decomposed tissues; the detection of a *sausage-shaped tumour* in the abdomen, corresponding to some part of the intestine, presenting peristaltic movements, and altering during the progress of the case as regards its direction, extent, and shape; and the *end of the intus-suscepted portion* being felt or seen on examination through the anus, or more or less of it being discharged in a gangrenous condition. In the latter case sudden perforation and its consequences may happen. There are generally some important distinctions between invagination of the *small* and *large* intestines, namely, that in the former the symptoms are greatly more severe and acute in their progress; hæmorrhage is much more abundant, blood being also sometimes vomited; while in the case of the large bowel there is generally much tenesmus, with dysenteric stools. *Physical examination* may afford some aid in localizing the mischief. A large proportion of the cases of intus-susception end fatally, those in which the large intestine is involved sometimes lasting for many weeks or months. The several events which may happen in their course are indicated in the account of the morbid anatomy.

5. It is scarcely practicable to indicate the characters of obstruction from **spasm** or **paralysis** of the muscular coat. The occurrence of chronic constipation in a hysterical female, ending in complete obstruction, might suggest paralysis, though probably the previous accumulation of fæces actually originates the obstruction. It generally yields to treatment.

PROGNOSIS.—Without entering into details, it will be evident that all forms of obstruction of the bowels are exceedingly dangerous. The cases most speedily fatal are those due to strangulation or intus-susception. The chronic varieties are liable at any moment to end in complete closure. Accumulations may often be got rid of, and thus recovery be brought about.

TREATMENT.—The treatment must be separately considered, according as intestinal obstruction is *chronic* and *gradual* in its progress; or *sudden* and *acute*.

1. In *chronic* cases the main principles are to regulate the diet strictly, allowing only liquid or pultaceous, highly digestible, and nutritious articles in moderate quantities; to endeavour to keep the bowels acting comfortably, for which purpose mild enemata answer best, at the same time avoiding the use of strong purgatives; to remove, if possible, anything causing compression, as well as any accumulation; to support the strength of the patient, and improve the general condition; to treat troublesome symptoms referable to the digestive organs; and, in appropriate cases, to have recourse to certain operations.

Should there be a *stricture in the rectum*, it may often be dilated successfully by the cautious use of the *bougie*. In certain instances also it is desirable to make an artificial anus above an obstruction, as described in surgical works, which may prolong life considerably, at the same time giving marked relief.

2. In cases of *acute* obstruction, from whatever cause, a matter of prime importance is not on any account to excite the intestines by giving powerful purgatives. It is allowable to use enemata cautiously, so as to clear out the bowel below the seat of obstruction. Of course little or no food should be taken by the mouth, and very soon the smallest quantity is immediately rejected; therefore all the necessary support, including *stimulants*, when required, must be administered *per rectum*, and frequently considerable quantities of the latter are needed. The patient may be permitted to suck ice freely. The most important internal remedy is opium in full doses; or subcutaneous injection of morphia may be employed. Belladonna is also of much value, or this drug combined with opium. In the treatment of intus-susception, tobacco has been employed, usually in the form of an enema of its infusion, but it is a dangerous remedy. *External applications* over the abdomen of dry heat, poultices, fomentations, turpentine stupes, or sinapisms are very serviceable. Vomiting and other symptoms require the usual remedies for their relief. In the treatment of intus-susception, the gradual injection of a large amount of liquid or air *per anum* has been frequently practised, and apparently with benefit. This injection may be effected by means of the syphon-enema, as in a case reported by Dr. Pearson Irvine (*Medical Times and Gazette*, Nov. 25, 1876), in which this method of treatment, followed by subcutaneous injection of atropine, proved successful.

The question of an *operation* presents itself in many of these cases. Of course if there is any evident or suspected hernia, surgical interference is necessary. Another operation which might be indicated, and which has been successfully accomplished, consists in opening the abdomen, with the view either of removing some internal strangulation, or of reducing an invagination. If there is good reason to believe that the former exists, it is decidedly permissible to risk opening the abdomen, especially if the case seems otherwise hopeless. As regards intus-susception, it is considered by most authorities only allowable to attempt its reduction when the large intestine is involved. Under any circumstances the results are not very satisfactory.

CHAPTER XXIV.

INTESTINAL WORMS—HELMINTHIASIS.

IN the present chapter it is intended to give a brief account of the main facts relating to those animal parasites which infest the alimentary canal of human beings; but it will be convenient, in noticing their life-history, to allude to another phase of their existence, as they are found in other organs of the body. For a complete account of this subject the reader is referred to Dr. Cobbold's valuable works.

The ordinary intestinal worms include:—1. **Cestodes** or **tape-worms**. *a.* *Tænia medio-canellata*. *b.* *Tænia solium*. *c.* *Bothriocephalus latus*. 2. **Nematodes**. *a.* *Ascaris lumbricoides* (*round-worm*). *b.* *Oxyuris vermicularis* (*thread-worm* or *seat-worm*). *c.* *Tricocephalus dispar* (*hair-headed* or *whip-worm*). Among rare varieties are mentioned *tænia nana* or *egyptica*, *elliptica*, and *flavo-punctata*; *bothriocephalus cordatus*; *ascaris mystax*; *dochmius duodenalis*; *distoma crassum* and *heterophyes*.

ÆTIOLOGY AND DEVELOPMENT.—It seems tolerably certain that no intestinal worm ever develops in the bowel directly from an ovum deposited there by a previous tenant, but that this must be first discharged and undergo metamorphosis, being afterwards conveyed by some means through the mouth into the alimentary canal in a certain stage of development, and when it reaches its peculiar habitat it grows into the adult animal. As regards the development of the *nematodes*, an embryo forms in each ovum after its discharge in the stools, or, in the case of the thread-worm, even while it is in the intestines; no further change occurs so long as the ovum is outside the body, though it may retain its vitality for a long period. In this condition it is supposed to enter the alimentary canal in various ways, such as in water, vegetables, fruit, or impure starchy substances. The ova of thread-worms may also probably be carried to the mouth by the agency of the fingers or nails of a person already infected, these having been previously used for the purpose of scratching the anus. From some experiments, however, it would appear that the embryos of round-worms will not undergo any further change when introduced into the stomach in the free state, and it has been suggested that they are taken up by some other animal, such as a small worm, or an insect or its larva, which is swallowed along with vegetable and other articles of diet.

The development of *tape-worms* is better known. Segments of these, containing abundant ripe ova, separate and are discharged *per anum*, or even break up within the bowel; the ova escape and are scattered about in various ways; they are then swallowed by different animals, especially by pigs, oxen, and sheep, mixed with their food. In the alimentary canal of these animals the shell of the ovum ruptures, and then the embryo (*pro-scolex*) escapes, attaches itself to the mucous surface, and works its way into the tissues, until it reaches a suitable spot, where it settles down and undergoes further changes, presenting a head and neck

with appendages like those of a tape-worm (*scolex*), from which a vesicular appendage or bladder hangs down. In this stage the worm is named a *cysticercus* or *bladder-worm*, such as is seen in the muscles, liver, brain, and other organs and tissues of different animals, sometimes in human beings. Each tape-worm has a special form of *cysticercus*; that of the *tænia solium* is named the *cysticercus cellulosus*; that of the *tænia medio-canellata* the *cysticercus medio-canellata*. This *cysticercus* may remain for some years, or may finally perish; if, however, it in any way reaches the alimentary canal of the particular class of animal which it infests in the adult condition, it becomes attached by the head, the vesicle falls off, and then a succession of segments form, constituting the ordinary tape-worm. The usual way in which these larvæ reach the stomach, is in consequence of an individual eating the raw or imperfectly-cooked flesh of the animals which they infest; thus the *tænia solium* comes from pig's flesh (measly pork); the *tænia medio-canellata* from beef; while the *bothriocephalus latus* is believed to be conveyed by fish or molluscs.

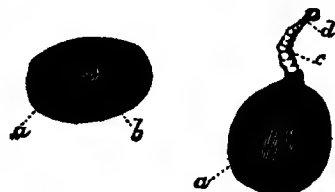


FIG. 4.*

FIG. 5.†

Different varieties of tape-worm are found in different parts of the world. In this country the *tænia solium* and *medio-canellata* are the forms met with, the latter quite as frequently as, if not more frequently than, the former. *Bothriocephalus* is prevalent in Eastern Europe as far as the Vistula, and in Switzerland, especially along sea coasts and rivers. Tape-worm is by far most frequent in those countries where much pig's flesh is consumed, and individuals who do not eat this kind of food, such as Jews, are particularly exempt from the complaint. It is frequently observed among those who, in connection with their occupation, are in the habit of putting knives used for cutting raw meat into their mouths, such as butchers, cooks, &c.; and also among those who indulge in raw or very underdone meat, or in sausages and such articles, as then the parasites are not destroyed. It must be remembered that in this country beef is often the meat by which tape-worm is conveyed. The *bothriocephalus* is supposed to be taken in drinking water. Women suffer more frequently than men; and usually the persons affected are between 16 and 40 years of age.

Round and thread-worms are principally found in children, especially if they are in bad health, or improperly fed and dirty. Round worms are very prevalent in some parts of the world, viz., in the Southern States of America, Greenland, Iceland, Brazil, and in some parts of Holland, Germany, and France, especially in low and damp districts. They are common enough in this country. It is presumed that an

* Fig. 4.—*Cysticercus cellulosus*, from the human brain, of its natural size, and with a retracted anterior extremity (b).

† Fig. 5.—The same *cysticercus* extruded: a. The caudal vesicle of the cysticercus, which is nothing but the *receptaculum scolici* (or hinder end of a tænid embryo), distended into a vesicle by the accumulation of water. c. The transversely-wrinkled anterior extremity of the cysticercus. d. Its head and neck, which conjointly form the tænid scolex.—(Von Siebold.)

unhealthy condition of the enteric mucous membrane, leading to the formation of much viscid mucus, favours the development of worms.

DESCRIPTION.—Only the main characters of the ordinary worms can be noticed in this work, so as to enable them to be recognized.

1. Tape-worms.—In the adult form (*strobila*) tape-worms are elongated, narrow, flattened, or tape-like in form, consisting of a head, a neck, and a series of thin flat, quadrilateral segments or links (*proglottides*), varying in number according to the length of the worm, united by a softer and more transparent tissue. The links grow from behind the neck by a process of budding, and then pass on, making room for those more recently formed, so that the oldest are the most distant from the head. At first they are very small, but

enlarge considerably as they become more mature, at the same time altering in form somewhat, and presenting a more complicated structure. Tape-worms are parenchymatous in structure, consisting of a soft, whitish, or yellowish-white contractile tissue; having no mouth or alimentary canal; but presenting a water-vascular system communicating between the segments, and well-developed sexual organs. These are not evident in the most recent links. The female apparatus appears first as a median tube with lateral branches, subsequently becoming more divided and developing ova, which almost completely fill the terminal links, rendering them opaque, and in these segments embryos may be visible. The male organs consist of tortuous seminiferous tubes and a penis. Each segment is hermaphrodite, and the sexual orifice is either single or double, opening either laterally or on one of the surfaces. All the varieties of tape-worm inhabit the small intestines ordinarily; rarely one may enter the large bowel or the stomach. As a rule only a single worm is present; occasionally there are two or more.



FIG. 6.*

1. *Taenia Solium.*—Length varies from a yard to 100 or 150 feet or more, but the average is stated by different authorities at from 5 or 7 to 20 or 30 feet. Head very small, somewhat globular or bulbous, with a slightly prominent conical snout or rostellum in front, surrounded by a double row of curved silicious hooks, from 12 to 15 in each row; and further back 4 suckers, symmetrically arranged. Neck extremely slender; from $\frac{1}{8}$ an inch to nearly an inch long; transversely-marked. Segments in their earliest stage very small, and much broader than long; gradually become more flattened and

* Fig. 6.—*Taenia solium armata* (of the natural size). Fragments taken at certain distances between the head and the posterior rings, in order to show the successive form of these rings; the order of the letters indicates their arrangement from before backwards.—(Davaïne.)

altered in the relation of their diameters, so as to be first square, and afterwards oblong, being much longer than broad, with the ends narrowed, especially the anterior extremity. Mature links measure

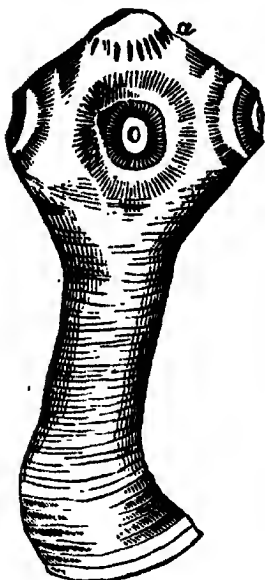


FIG. 7.*

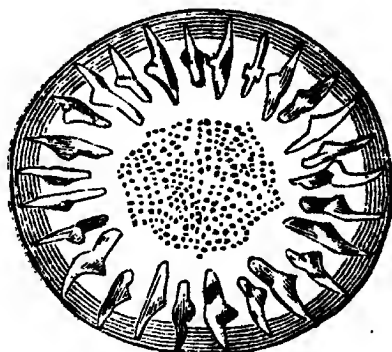


FIG. 8.†

about $\frac{1}{2}$ an inch long, and $\frac{1}{4}$ inch broad. *Male and female* organs open by one orifice, which is situated laterally in a little projection, now on one side, now on the other, but not regularly alternating.

2. *Tænia Medio-canellata*.—Has a general resemblance to *tænia solium*, with the following differences:—*Length* usually greater. *Head* larger, has neither snout nor hooks, being flattened in front, but its four suckers are very prominent and powerful. Leuckart describes a fifth smaller one between them. *Links* more numerous, broader, thicker, and firmer. *Sexual organs* more developed and divided; and orifice situated near the posterior border.

3. *Bothriocephalus Latus*.—*Length* very considerable. *Head* obtuse or club-shaped, having no hooks or prominences, but merely two longitudinal slits or

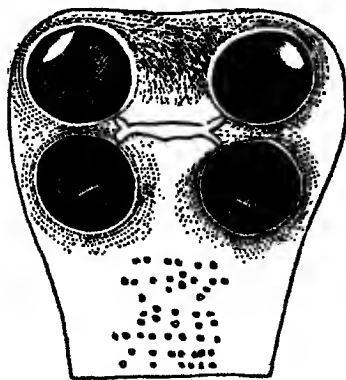


FIG. 9.‡

* Fig. 7.—Head and neck of *Tænia solium* magnified. *a.* Circle of hooks.

† Fig. 8.—Circle of hooks, more highly magnified.—(*Leuckart.*)

‡ Fig. 9.—Head of *Tænia medio-canellata*, highly magnified.—(After *Küchenmeister.*)



FIG. 11.†



FIG. 10.*

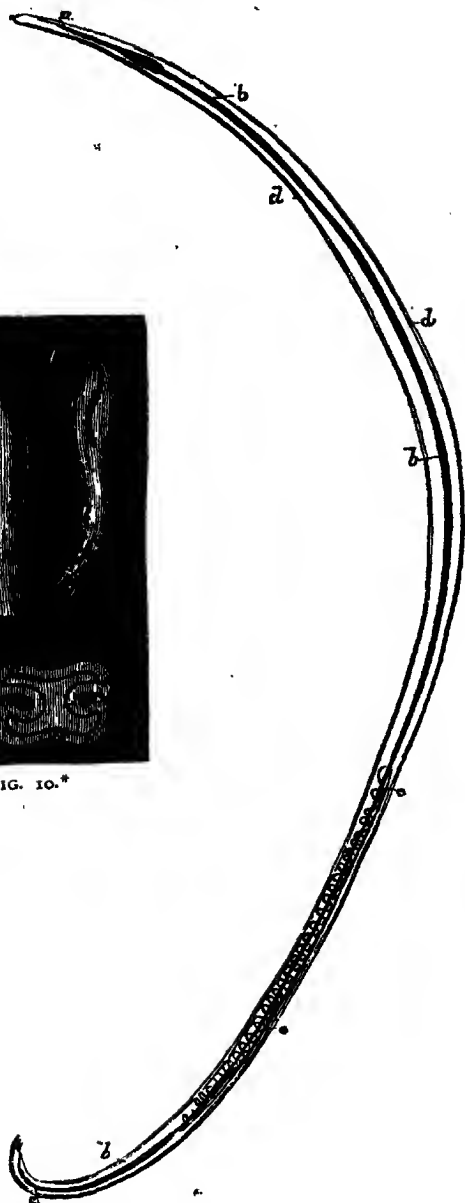


FIG. 12.‡

* Fig. 10.—*i* and *h*. Head of the *Bothriocephalus latus*, enlarged six times and seen in two different positions. *h*. Transverse section of the head of the bothriocephalus found in the turbot, magnified twelve times; this is introduced into the figure for the purpose of showing the arrangement of the lateral suckers.—(*Davaine.*)

† Fig. 11.—The *Bothriocephalus latus*, of the natural size, the fragments being taken at certain distances; the order of the letters indicates their relative situation, from the head to the posterior extremity; in *c*, *d*, *e*, *f*, the genital pore is visible; *g*, some of the terminal rings shrivelled up, after the deposition of the ova.—(*Davaine.*)

‡ Fig. 12.—Male of *Ascaris lumbricoides*, of the natural size. *a*. Œsophagus; *b*. Intestinal canal; *c*. Spermatic ducts; *d*. Lateral longitudinal line.—(*Küchenmeister.*)

grooved suckers, one on each side. *Neck* very short. *Segments* exceedingly numerous; not distinctly visible for a little distance from the head; at first nearly equal in diameters, but soon much broader than long; have a slightly brownish colour. *Sexual openings* in the middle of one surface of each segment, near its posterior border, and not lateral; they are distinct, that of the male apparatus being anterior. *Ova* of a brown colour.

II. NEMATODES. The main characters of the chief *nematodes* are indicated in the following description:—

1. *Ascaris Lumbricoides*.—*Form* elongated and cylindrical, but tapering towards the ends, especially the anterior. *Length* from 6 to 12 or 16 inches; and diameter 2 to 3 lines. Appears reddish, greyish-red, or yellowish-white, semitransparent, firm, and elastic. *Head* has three small prominences, with the mouth between them, lined with numerous teeth. A circular depression separates it from the body. *Body* presents fine transverse markings. *Sexes* are distinct. *Male* shorter, and curved posteriorly, where the sexual organs are placed. *Female* straighter, and thicker at the hinder extremity; has the sexual opening about the end of the anterior third. (See Fig. 12.)

Habitat small intestines, but often migrates into the large bowel, and out through the anus; or, rarely, to the stomach, œsophagus, mouth, nares, frontal sinuses, windpipe, bile and pancreatic ducts or gall-bladder, peritoneum, vagina, urinary organs, and various other parts.

Number usually several; may be hundreds; sometimes only one.

2. *Oxyuris Vermicularis*.—Very small and delicate; fusiform; *males* measuring from 1 to 2 lines long; *females* about 5 lines. Whitish and semi-transparent; surface presents fine transverse striæ. *Head* has a terminal mouth, with 3 scarcely evident lips, and a wing-like expansion on the dorsal and ventral aspects. *Male* is rolled up posteriorly, where the sexual organs are placed. *Female* is straight or but slightly bent, and has the vulva about the junction of the anterior and middle thirds.

Habitat the rectum and lower part of colon. Often migrate around the anus, into the vagina, urethra, or under the prepuce. Have been seen in the small intestines and stomach.

Number usually very great; hundreds or thousands.

3. *Tricocephalus dispar*.—*Thread-*



FIG. 13.*

* Fig. 13.—Female *Oxyuris vermicularis*: 1. Four oxyurides of the natural size. 2. The cephalic end magnified; the œsophagus and stomach are shown. 3. The caudal extremity magnified. 4. The head greatly enlarged; *a*, the mouth furnished with three lips; *b b*, the lateral expansions of the integument.—(Davaigne.)

like in form, being from 1 to 1½ or 2 inches long. Posterior end thicker than anterior, which is hair-like, and ends in a simple terminal mouth. *Male* is the smaller, and is spirally coiled posteriorly. *Female* is larger and thicker, only slightly curved; the uterus contains an immense number of ova.

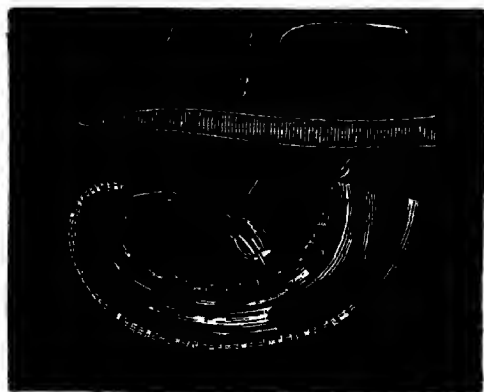


FIG. 14.*

Habitat usually the cæcum, rarely the colon, very rarely the ileum. The head is generally imbedded in the mucous membrane, while the body moves freely.

Number usually not great, but may be hundreds.

SYMPTOMS AND DIAGNOSIS.

—Worms frequently exist in the alimentary canal without setting up any evident symptoms. When present these are usually indicative of (1) *local irritation*; (2) *reflex disturbance*; and (3) more or less *constitutional disorder*.

Occasionally worms lead to congestion, inflammation, superficial erosion of the mucous surface, or even to slight ulceration; in exceptional cases they may even cause obstruction of the bowels; or, by migrating into the stomach, bile-ducts, liver, larynx, peritoneum, and other parts, may originate dangerous symptoms referable to either of these structures. It may be stated as a general rule that the symptoms are more marked in delicate and weakly persons, or in those whose nervous system is highly susceptible; and that they are proportionate to the number and size of the worms.

The *local* symptoms attending the *tape*- and *round-worms* are uneasiness, curious sensations, or actual griping pain in the abdomen, especially about the umbilicus; sometimes attacks of severe colic, attended with vomiting or retching, and faintness; capricious and variable appetite, often with craving for special and indigestible articles of food; furred tongue, and foul breath; nausea or vomiting; irregularity of the bowels, constipation and slight diarrhoea alternating from time to time, the stools sometimes containing mucus; flatulence, with distended abdomen. The main *reflex* phenomena described include itching at the various mucous orifices, which causes the patient to scratch the anus, or pick the nose; salivation; grinding of the teeth during sleep, which is uneasy and disturbed; dull frontal headache, with giddiness; noises in the ears; squinting, dilated pupils, oedema of eyelids, ~~flashes~~ and specks before the eyes; twitchings of the limbs or facial muscles, or even violent general convulsions ending fatally; choreic, hysterical, epileptic, or maniacal attacks; deranged menstruation; palpitation; and a feeling of constriction in the throat. Among the *general* symptoms observed are more or less wasting; pallor; a sense

* Fig. 14.—The *Tricocephalus dispar*: 1. The male, of the natural size. 2. The female, of the natural size. 3. The head magnified. 4. The tail, also greatly enlarged.—(Dovaine.)

of debility and languor ; pains in the limbs ; fretfulness and depression of spirits.

In a diagnostic point of view these symptoms are by no means characteristic of worms, and it is often a question how far they are originated by their agency ; still when such phenomena are present, worms should always be thought of. The diagnosis may be verified by the passage *per anum* of fragments of a tape-worm, or of entire round worms ; and if necessary, remedies may be given with the view of aiding their expulsion. Microscopic examination of the stools, for the purpose of discovering ova, is recommended in suspected cases. Portions of tape-worm sometimes escape spontaneously as the patient is walking along.

Thread-worms are very common in weakly and dirty children, and as they are often extremely numerous, they give rise to much local irritation, causing severe itching and tickling about the anus, which leads to constant scratching ; this is especially intense towards night, and may gravely interfere with sleep. I have also met with cases in which they caused much annoyance in adult females. Occasionally these worms excite considerable dysenteric symptoms, and not uncommonly they originate prolapsus ani. They also frequently pass into the vagina, causing much irritation here, and inducing catarrh, undue sexual excitement and masturbation, or now and then severe hæmorrhage. By getting under the prepuce, thread-worms also promote the habit of masturbation in males. On examination they may often be seen moving in the vicinity of the anus ; as well as in abundance in the stools. Various reflex symptoms are often attributed to thread-worms, but with doubtful propriety.

The *tricocephalus dispar* does not give rise to any symptoms.

PROGNOSIS.—Most intestinal worms may be readily got rid of, if properly treated. *Tape-worms* are sometimes difficult to remove completely, but with systematic management a cure may almost always be effected. It is the safest plan to see that the head of a tape-worm is discharged, else if this remains a further growth will probably take place ; however, it is affirmed that if only the head and a small portion of the neck is left, the worm will die ; and, further, the nearer the head any portion is which is detached, the more easily will the rest be got rid of. Worms may now and then prove highly dangerous by their migrations, or by causing obstruction of the bowels ; death may also occur in children from reflex convulsions excited by their agency.

TREATMENT.—1. If worms are present in the intestines, of course the first object in treatment is to get them expelled. The remedies for this end must vary with the nature of the parasite. For *tape-worm* the following plan of treatment is usually efficacious:—To make the patient take only liquids, such as milk and beef-tea, for a day ; then to administer a full dose of castor oil in the evening ; and, finally, early on the following morning, if the oil has acted well, to give a draught, containing the liquid extract of male fern, in the dose of η x to ζi or ζiss , according to age. The draught may be made up with sugar, mucilage, and milk ; or with the yolk of an egg and cinnamon water. The object of this plan is to clear out the bowels so as to expose the worm, and then the male fern acts upon it and kills it. Sometimes it is desirable to follow up the draught with another dose of castor oil, but generally this is not

needed, as the drug itself acts as a purgative. Some authorities prefer giving the extract in smaller doses, frequently repeated; others employ the powdered fern. In order to see whether the head of the worm is discharged, each stool must be received into a separate vessel, then mixed with water, and filtered through coarse muslin.

Other *anthelmintics* employed for the destruction of tape-worms are kousso, followed by a cathartic; kamela powder (3i to 3iij in treacle or syrup); decoction of the bark of the root of pomegranate (3ij in Oj, boiled down to Oss); powdered areca nut; oil of turpentine (3i to 3ss); and petroleum (m xx to xxx). If the worm projects through the anus, it has been recommended to roll it gradually round a piece of stick, and thus draw it out; or to apply some poisonous agent to the protruded portion.

For *round-worms* the most efficient remedy is santonin, which is the active principle of the popular worm-seeds. It is well before administering this drug to give an *aperient*, such as a little jalap with scammony; and to limit the diet to liquids for a day. Santonin may be employed alone, gr. i—v every morning, for two or three days, mixed with sugar or syrup, or made up into lozenges, or with gingerbread. It seems to be more efficacious when mixed with castor oil, and Kückenmeister advises that from gr. ij—iv be dissolved in 3i of the oil, and 3i taken every hour until it acts. Other preparations used containing santonin are an ethereal extract of worm-seeds, and santonate of soda. Mucuna and powdered tin are also employed for the expulsion of round-worms, which act by causing mechanical irritation. Some practitioners rely merely upon strong *purgatives*.

Santonin is also useful internally in the treatment of thread-worms, but these are decidedly best got rid of by means of *enemata*, of which many kinds have been employed. Any of the following will answer well, viz. :—Common salt and other alkaline salts dissolved in water or gruel (3i to Oj); santonin with castor oil; infusion of quassia; infusion or decoction of wormwood; tincture of steel (3i to Oj of water or infusion of quassia); olive oil; lime-water; decoction of aloes; decoction of rue; turpentine with gruel; or even mere water, if employed freely for a few days. Cleanliness is of great importance.

The tricocephalus requires no special treatment.

2. In all cases of intestinal worms it is essential to look to the state of the *general health*, and to improve this by means of steel and other *tonics*, with cod-liver oil, if required; as well as by the regulation of diet, and attention to hygienic measures. The *alimentary canal* must also be attended to, and the bowels kept freely acting, so as to prevent accumulation of unhealthy mucus. Scammony, jalap, rhubarb, and castor oil are the best *aperients* in these cases, and either of the powders may be advantageously combined with carbonate of soda or magnesia.

3. The *prevention* of worms is a matter of considerable importance in some parts of the world, especially as regards tape-worms, and this can only be effected by taking every precaution against those habits mentioned under the *ætiology*, by which the ova are conveyed into the stomach, such as eating raw or partially cooked meat; putting knives into the mouth; or drinking impure water. Stools known to contain any kind of worms or their ova should be immediately des-

troyed. Of course meat that is measly ought on no account to be taken as food. In the case of children, important prophylactic measures against the development of worms consist in the maintenance of good health; the preservation of the digestive organs in a satisfactory condition; and attention to cleanliness.

TRICHINOSIS.

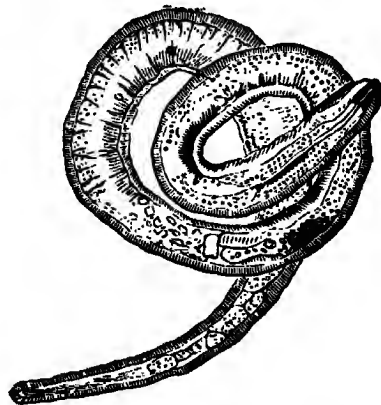
It will be convenient to consider in the present chapter a disease due to the entrance into the human body of a parasite named *trichina spiralis*. This complaint is very rarely met with in this country, but is not uncommon in some parts of the continent, where it occurs sometimes as an epidemic.

ÆTIOLOGY AND PATHOLOGY.—Trichinæ are introduced into the human body solely by eating pig's flesh in which they exist, either in a raw or imperfectly cooked condition, or in the form of pickled and smoked articles, sausages, etc. When this reaches the stomach and bowels, the parasites are liberated and develop with great rapidity, the females being by far the more numerous and the larger, and originating an immense number of young trichinæ, which perforate the intestinal wall, migrate along the mesentery to the spine, and pass thence to all parts of the body, entering into the substance of the muscles, penetrating even the sarcolemma. These structures constitute their *habitat*, and here they set up inflammatory action, becoming surrounded by a capsule or shell. It is supposed that there are several productions of young trichinæ in the alimentary canal, with subsequent migrations.

ANATOMICAL CHARACTERS.—In man trichinæ at first excite gastro-



FIG. 15.*



tooth of an inch + 300.

FIG. 16.†

enteric catarrh, often attended with enlargement of the mesenteric glands. After about the fifth or sixth week the muscles, when examined with a lens, are seen to present fine striæ or minute dots, of a greyish-

* Slightly magnified cyst of *Trichina Spiralis*.—(Virchow.)

† The *Trichina Spiralis* removed from its cyst.—(Virchow.)

white and opaque aspect, which are collections of the parasite, contained in capsules or cysts produced by their irritation. These become more abundant as the case advances, and they are chiefly observed in the muscles of the loins, the diaphragm, intercostals, muscles of the neck, eye, larynx, and tongue. In the limbs they are mainly found in those nearest the trunk, being most numerous near their tendinous attachments. The affected parts feel unusually firm and resistant. On microscopic examination the muscular fibres are found to be more or less destroyed, and the interstitial connective tissue increased. Each little cyst (Fig. 15) is somewhat ovoid in shape, being at first transparent, but soon becoming thicker and more opaque, and ultimately calcifying. The *trichina* (Fig. 16) is coiled up in its interior, and is very minute, the female being larger than the male. The head is finely pointed, unarmed, with a minute mouth in the centre. In fatal cases of trichinosis extensive bronchitis, pulmonary congestion or inflammation, venous thrombosis, and parenchymatous degeneration of various organs are frequently observed.

SYMPTOMS.—Trichinosis generally begins with symptoms of more or less gastro-enteric disorder, such as a sense of pressure and fulness in the epigastrium, impaired appetite, discomfort after eating, nausea or vomiting, eructations, colicky pains, and diarrhoea, with a feeling of much languor and depression; in some cases the onset is characterized by violent sickness and purging, simulating cholera or irritant poisoning. Occasionally the disease sets in quite insidiously, with merely a feeling of lassitude and depression, wandering pains, and stiffness in the limbs. The subsequent characteristic symptoms are those dependent upon the condition of the muscles. Those of the limbs which are affected become painful, tender, swollen, hard, and rigid; there is much stiffness, movement being greatly impaired, and the joints are fixed in a state of more or less flexion, any attempt to extend them causing severe pain. From implication of various muscles there may result attacks of severe dyspnoea, aphonia, trismus, dysphagia, impaired movement of the tongue, and other symptoms. A peculiar œdema is also observed, affecting the face and eyelids, and extending in the limbs from the upper part towards the hands and feet.

Symptomatic pyrexia accompanies this condition, often severe, the temperature sometimes rising to 106°, and the pulse to 120 or 140; abundant clammy perspirations may be observed, and occasionally sudamina appear. In cases tending towards a fatal issue low typhoid symptoms set in, frequently accompanied with signs of bronchitis, pneumonia, and other inflammatory affections. Should recovery ensue, the muscular symptoms subside, as well as the pyrexia, but convalescence is usually protracted, marked debility, anæmia, and œdema remaining for a considerable time.

DIAGNOSIS.—Trichinosis may in severe cases be mistaken at first for cholera or irritant poisoning. It may also simulate typhoid fever in the early stage. After a time the symptoms referable to the muscles are quite characteristic.

TREATMENT.—To prevent trichinosis, meat containing the parasites must be avoided, and microscopic examination of pig's flesh is practised in some parts of the continent, before it is allowed to be sold. In

order to be quite safe, the best plan is never to eat any pig's flesh which has not been thoroughly cooked. In the treatment of the actual disease, a matter of the first importance is to get rid of the trichinæ from the alimentary canal, by means of castor oil or some other aperient, which may be given even though diarrhoea should be present. Benzine, carbolic acid, and other drugs have been administered with the view of destroying the parasites, but it is doubtful whether they succeed in this object. The *general* treatment must be of a supporting character, quinine and *stimulants* being also administered. Hot and anodyne fomentations, or warm baths, most effectually relieve the symptoms connected with the muscles. Other symptoms and complications must be treated as they arise.

CHAPTER XXV.

DISEASES OF THE LIVER AND ITS APPENDAGES.

CLINICAL CHARACTERS.

THE liver is an organ which performs several functions highly important in the animal economy. The most obvious of these is the formation of bile, which is not only useful for purposes connected with digestion, but is also undoubtedly eliminatory. Consequently biliary derangements have always occupied a prominent place, both with the profession and the public, in accounting for the causation of a large number of ailments. The liver has also a glycogenic function, and the disorders to which this is supposed to be liable have already been discussed in connection with diabetes. Moreover, it has recently been maintained by Gamgee and others that this organ forms urea. As the result of functional derangements of the liver a number and variety of morbid conditions and symptoms have been supposed to originate, not only associated with the alimentary canal, but also with remote organs, and with the general system, including the gouty state or lithæmia. For a full discussion of this subject reference may be made to the work on Diseases of the Liver, by the late lamented Dr. Murchison. In my opinion the view which attributes all these disorders solely to the liver is too exclusive; at any rate they cannot be discussed here, and in the following summary of the clinical phenomena connected with hepatic diseases, only those will be referred to which are obviously associated with the liver, and which are met with more or less when this organ is the seat of organic diseases, or when its functions are interfered with in various ways.

1. **Morbid sensations** connected with the liver are referred mainly to the right hypochondrium, but may extend across the epigastrium to the opposite side, or they may shoot in various directions. They include different kinds of pain, with or without tenderness; or merely a sense of uneasiness, fulness, weight and

heaviness. Sympathetic pains in the right shoulder are supposed to be very common in hepatic diseases.

2. Some important symptoms result from **disturbance of the biliary functions**, the chief being those associated with *jaundice*, under which they will be discussed. Bile may also be secreted *in excess*, thus acting as an irritant, and causing bilious diarrhoea and vomiting. It may also be *deficient in quantity* or of *improper quality*, hence originating signs of deranged digestion in the intestinal canal.

3. **Obstruction of the portal circulation** leads to mechanical congestion of its tributary veins. The obvious clinical phenomena which may result therefrom are those indicating gastro-intestinal catarrh and its consequences; hæmorrhage into the alimentary canal; ascites; enlargement of the spleen; distension of the superficial abdominal veins; and hæmorrhoids. After death the veins within the abdomen are often found much enlarged and varicose; while the spleen and pancreas present the usual morbid changes which follow long-continued venous congestion.

4. Important symptoms arise from disturbance of the **glycogenic functions** of the liver. These have already been sufficiently discussed under *diabetes*, and they are not noticed in connection with mere local diseases of this organ.

5. If the liver is enlarged, it sometimes originates symptoms by **pressing upon neighbouring structures**, such as the diaphragm, inferior vena cava, or duodenum.

6. **Physical examination** of the liver may demonstrate either displacement; alteration in shape; enlargement; contraction; or alteration in the characters which the organ presents on palpation. The general characters of *hepatic enlargement* are as follows:—(i.) Its site corresponds to that of the liver, or there is a history of its having grown from this direction; it does not descend into the pelvis, but can be traced within the margin of the thorax, and appears to be superficial; sometimes it is distinctly visible, or even bulges out the lower part of the chest. (ii.) Though the dimensions may be very great, yet as a rule the normal general outline of the liver can be traced more or less distinctly; while the sensations on palpation are often sufficiently characteristic. (iii.) The organ is somewhat movable on manipulation, but not to any marked extent. (iv.) On percussion there is absolute dulness, with considerable sense of resistance generally; the dulness can be traced upwards towards the chest, and may have the curved outline regarded as characteristic of the liver; it is, however, influenced by different degrees of distension of the stomach and bowels. (v.) The movements of the diaphragm are often interfered with, especially on the right side; but the liver is generally a little altered in position by deep breathing. (vi.) Posture may also affect the organ, it being more prominent and lower in the abdomen in the standing posture.

7. Occasionally the **gall-bladder** presents an enlargement, which has the following general characters:—(i.) It usually occupies the right hypochondrium, and can be felt coming from underneath the margin of the liver, appearing to be superficial; occasionally, however, it is so much enlarged as to extend down to the crest of the

ileum. (ii.) As a rule the shape is pyriform, with the base towards the surface. (iii.) The surface is generally smooth, and the enlarged organ has in the great majority of cases an elastic or fluctuating feel. (iv.) Almost always the tumour is very movable from side to side, turning on a fixed point, which lies under the liver; even a change of posture may alter its position considerably. Now and then it is fixed by adhesions.

CHAPTER XXVI.

ON FUNCTIONAL DISORDERS OF THE LIVER.

I. HEPATALGIA.

THE occurrence of intermittent attacks of severe pain in connection with the liver has been attributed, especially by the late Dr. Anstie, to a simple neuralgia in some instances. This affection is but a part of a general nervous condition, attended with similar pains in other parts, as well as with deep mental depression. The attacks are not accompanied with vomiting, but it is said that there may be jaundice. The main difficulty in diagnosis lies in separating the pain of hepatalgia from that due to the passage of a gall-stone.

II. JAUNDICE—ICTERUS.

Jaundice is another of those symptoms which has been dignified by being described as a special disease. Essentially it merely signifies the peculiar discoloration of the skin and other structures which is observed when the bile-pigments accumulate in the blood.

ÆTIOLOGY AND PATHOLOGY.—Cases of jaundice have long been divided into:—1. Those in which there is a mechanical obstruction preventing the escape of the bile through the ducts. 2. Those in which no such obstruction exists.

1. **Jaundice from Obstruction.**—This may be due to:—(i.) *Impaction of some foreign material* in the hepatic or common bile-duct, viz., a gall-stone; thickened or gritty bile; mucus; rarely parasites, either formed in the liver or its duct (*distoma hepaticum** and *hydatids*), or having entered from the intestines (*round-worm*); very rarely fruit stones or other bodies which have passed into the duct from the bowels. (ii.) *Catarrh of the mucous membrane* of the duct, or of the duodenum about the orifice, causing narrowing of its canal. (iii.) *Organic changes* in the walls of the duct or at the orifice, leading to more or less *stricture*, or even to complete *obliteration*, viz., congenital constriction or closure;

* The *distoma hepaticum* or liver-fluke is a small trematode worm, often found in sheep, very rarely in the human being, occupying either the gall-bladder or bile-ducts. It is of a flattened, elongated, oval form; soft; and brownish or yellowish in colour.

thickening of the walls from inflammatory changes; peri-hepatitis; or cicatrization of an ulcer, either in the duct or the duodenum. (iv.) *Pressure* upon the duct, *invasion of its canal*, or *closure of its opening*, by tumours or growths, especially by projecting growths from the liver; enlarged glands in the portal fissure; and pancreatic disease implicating the duodenum: rarely by a pyloric tumour; growths in or behind the peritoneum; hepatic aneurism; fæcal accumulation in the colon; uterine and ovarian enlargements, including pregnancy; or a renal tumour or displaced kidney. (v.) *Spasm* or *paralysis* of the muscular coat of the duct (?).

Physiologists differ in their views as to the mode in which the bile is secreted, and this influences the opinions held as to the pathology of *obstructive jaundice*. It is generally maintained that both the bile-acids and bile-pigments are formed in the liver; some physiologists believe, however, that the latter are generated either partly or entirely in the blood, and merely separated by the liver. Hence arise the two theories:—1. That the discoloration of jaundice is due to *excessive absorption* of the bile by the veins and lymphatics after its formation. 2. That it results from *suppression of its secretion*, and the consequent retention of the pigment in the blood. The former is probably the correct view, and the intensity of the jaundice will be in proportion to the rapidity with which the secretion of bile is going on, and to the slowness of its decomposition in the blood. Absorption of biliary secretion is always proceeding in the normal state, but the bile thus taken up is speedily changed in the process of nutrition.

2. *Jaundice without Obstruction*.—The conditions under which this variety is supposed to occur are:—(i.) In certain *specific fevers*, viz., yellow, remittent, intermittent, and relapsing fevers; very rarely in typhus, typhoid, or scarlatina. (ii.) When certain *poisons* are present in the blood, especially in connection with pyæmia; snake-bites; poisoning by phosphorus, mercury, copper, or antimony; and after the inhalation of chloroform or ether. (iii.) In *acute* or *chronic atrophy* of the liver; or after *destruction of its tissue* from any cause. (iv.) In *congestion* of the liver. (v.) From *disturbed innervation*, especially after sudden intense mental emotion. (vi.) When the blood is *insufficiently aerated*, as in cases of pneumonia, in new-born infants, or as the result of overcrowding and bad ventilation. (vii.) Where bile is formed in *great excess*. (viii.) In cases of *habitual* or *long-continued constipation*. (ix.) In certain states of the *portal system of veins*, such as when they contain abundant pigment granules; or when they are unusually empty after profuse hæmorrhage from the alimentary canal. (x.) As an *epidemic* (?).

Before mentioning the various explanations which have been given of the occurrence of jaundice under the circumstances just enumerated, I cannot but express my agreement with those who consider that in many of these cases it results from obstruction, at all events to some degree, which obstruction may arise from pressure upon the smaller ducts within the liver; from catarrh of the main ducts; or from the formation of plugs of mucus. The views suggested by different writers as to the pathology of the various forms of *non-obstructive jaundice* are, that it is dependent upon:—1. *Suppression of secretion*. 2. *Increased*

absorption, so that more bile enters the blood than can undergo decomposition, either from excessive secretion; undue retention of bile in the intestines, owing to constipation; or diminution of pressure in the portal vessels.

3. *Impaired and delayed metamorphosis* of the bile-elements in the blood, some being of opinion that the bile-acids are converted in this fluid into bile-pigments, owing to imperfect oxidation.

4. *Conversion of the hæmatine of the blood into bile-pigments.* With regard to the influence of nervous disturbance in producing jaundice, it is presumed that this may affect the activity of the secretion; the state of the portal veins; or the rapidity of the changes in the blood.

Jaundice is by no means a necessary accompaniment of even grave organic disease of the liver itself, and, in such cases, when it is marked, it is generally owing to some projection from this organ interfering with the main duct; or to the glands in the portal fissure being involved. It may, however, be due to destruction of the hepatic tissue; or to the ducts or the portal branches in the substance of the liver being interfered with.

ANATOMICAL CHARACTERS.—In marked jaundice not only are the skin and conjunctivæ more or less stained with bile-pigment, but likewise most of the tissues, organs, and fluids of the body, as well as morbid exudations and effusions. In the skin the pigment accumulates chiefly in the rete mucosum, at the same time involving the sweat-glands considerably. The nerve-tissues are but slightly affected; and the mucous membranes generally, with their secretion, still less. The bile-pigments are found in the clot and serum of the blood, but not the bile-acids; in prolonged cases coagulation is imperfect, and the corpuscles are altered in their characters; while not uncommonly extravasations of blood are found. In cases of obstructive jaundice the liver itself becomes at first enlarged uniformly, without any alteration in shape, and mottled of a more or less deep yellow tint, or in some cases being olive-green; its ducts are distended; and in time numerous particles of pigment collect in the hepatic cells. Should the obstruction implicate the common duct, the gall-bladder will be distended. If the obstruction is persistent, the liver undergoes degeneration, becoming atrophied, very dark or sometimes almost black, and softened, many of its cells being destroyed, leaving only a granular detritus, which is visible under the microscope. The kidneys also are much changed in prolonged cases, being deeply coloured, their tubules containing a black or brown deposit, and their secreting cells presenting granules of pigment, or ultimately breaking down and undergoing destruction.

SYMPTOMS.—The most obvious clinical phenomena associated with jaundice are those derived from the *external discoloration*; the characters of the *urine*; and the consequences of *absence of bile from the alimentary canal*. Usually the earliest signs are afforded by the urine; next by the conjunctivæ; and lastly by the skin. The conjunctivæ are more or less deeply tinged of a yellow colour. The skin may present a variety of tints, from a faint yellow to a brownish- or blackish-green. The colour is deepest where the epidermis is thin, and varies with age, complexion, amount of fat, and other circumstances. If the lips or gums are pressed, so as to expel the blood, a yellowish hue is often observed. The urine exhibits a colour ranging from a light saffron-

yellow to one resembling mahogany or porter; on standing it usually becomes greenish. Its froth is yellow, and it will tinge white linen or blotting-paper dipped into it, often staining the under-clothing. Chemical examination is most important, as indicating the presence of *bile-pigments*; and, as many believe, of *bile-acids*. The former are tested for by nitric acid; the latter by sulphuric acid and sugar. (See EXAMINATION OF URINE.) Dr. George Harley and others affirm that the *bile-acids* are only present in the urine in cases of *obstructive* jaundice, and not in that due to *suppression*; also that they may disappear in prolonged cases of the former, owing to destruction of the liver-tissue. Another important character presented by the urine is, that it often contains *leucine* and *tyrosine*, crystals of which may be seen under the microscope, after careful evaporation of some of the excretion to a syrupy consistence. In some cases the quantity of urine is below the normal at first; the reaction is acid; the proportion of urea and uric acid varies, and these constituents may be in excess. In prolonged cases sugar sometimes appears. Renal epithelium or casts tinged with biliary colouring matters are occasionally observed.

When the bile does not reach the intestines, the consequences are constipation, with unhealthy stools, these being deficient in colouring matters, often pale drab or clay-coloured, dry, and offensive, also containing excess of fat; and the formation of much foul gas from decomposition of the intestinal contents, with consequent flatulence and the passage of foetid flatus. Occasionally diarrhoea is observed from time to time; or dysenteric symptoms set in. There is usually a disinclination for food, especially for fatty matters; and eructations are common, which may have a bitter taste.

Evidence is often afforded of the presence of bile in the sweat, milk, saliva, and tears. From the accumulation of bile-acids in the blood result not uncommonly cutaneous itching, which may be very distressing; slowness of the heart's action and pulse, which may fall to 50, 40, 30, or even 20 per minute; and a feeling of languor, depression, debility, lowness of spirits, incapacity for exertion, irritability, and drowsiness. The symptoms last-mentioned are also partly due to the emaciation and impaired nutrition which usually soon become apparent, in prolonged cases being very marked. In some instances urticaria, lichen, boils, carbuncles, or petechiæ are observed. Yellow vision (*xanthops*) is an extremely rare phenomenon, and its cause is very uncertain.

Jaundice, especially the non-obstructive variety, may be accompanied with typhoid symptoms; with low nervous phenomena; or with dangerous hæmorrhages, particularly from the stomach and bowels, ending speedily in death. It is important to observe that these phenomena are often quite out of proportion to the intensity of the jaundice. They have been attributed to the accumulation in the blood of bile-acids, of cholesterin, of products resulting from the decomposition of bile-acids or their formative elements, or of some noxious substance formed in the cells of the liver; or to the metamorphosis of materials in the process of preparation for excretion by the urine being checked or modified, owing to a deficiency of bile, which is required for these changes, so that, instead of urea and such compounds, intermediate products are formed, which collect in the blood and act as poisons. Might it not be that, in some

of these cases at all events, the above symptoms are independent of the jaundice, and result either from some general morbid state, or from some condition of the kidneys which leads to blood-poisoning?

Physical examination will probably in cases of obstructive jaundice reveal in a short time enlargement of the liver, not great, and quite regular in outline. If the common duct is obstructed, the gall-bladder may also present a fluctuating enlargement. In prolonged cases the liver may ultimately afford the physical signs characteristic of atrophy.

The *course, duration, and intensity* of jaundice vary greatly according to its cause. It may be merely a slight temporary disturbance; or permanent and extreme in degree.

DIAGNOSIS.—The first matter in diagnosis is to be certain that jaundice is present. The discoloration of the skin might possibly be simulated by a chlorotic tint; by the cachexia of chronic lead-poisoning, malaria, or cancer; by the colour associated with supra-renal disease; or by bronzing from exposure to the sun. The conjunctivæ and urine should always be particularly examined. It must be remembered, however, that the yellowness due to the collection of fat under the conjunctiva may be mistaken for that of jaundice. Also pigments sometimes form in the urine, which render it very dark; and now and then malingerers purposely stain the skin, and add colouring matters to the urine.

It may be difficult to determine whether jaundice is of the *obstructive* or *non-obstructive* variety, but the latter, as well as its particular cause, may be generally recognized:—1. By the circumstances under which it occurs; and the collateral symptoms. 2. By the discoloration being less marked. 3. By the presence of more or less bile in the stools. 4. By examination of the urine, which, according to Dr. G. Harley, gives indications of the presence of bile-acids only in the obstructive form of jaundice, though many observers deny this; and which in the non-obstructive variety yields leucine and tyrosine.

The precise cause of *obstructive* jaundice is determined by:—1. The age, sex, habits, and general past history of the patient. 2. The preceding and accompanying symptoms, both local and general. 3. The rapidity with which the jaundice has set in; and its intensity. 4. Careful *physical examination* of the abdomen. 5. The course and progress of the case; and the effects of treatment. Intelligent attention to these points will generally lead to a correct opinion. The more rare causes can only be made out by exclusion, and are often merely guessed at. The fact of the gall-bladder being enlarged or not will as a rule show whether any obstruction involves the hepatic or the common bile-duct.

PROGNOSIS.—In most cases the prognosis of jaundice depends rather upon the morbid condition with which it is associated, than upon this particular symptom. As a rule, therefore, it may be stated that *non-obstructive* jaundice is much the more grave. Typhoid and low nervous symptoms are highly dangerous; as are also hæmorrhages, and signs of interference with the renal secretion. In *obstructive* cases not only will the prognosis vary with the cause of the jaundice, but likewise with the rapidity with which it comes on; its intensity; and its mode of progress. In every case a cautious prognosis should be given, as it is never certain how matters may turn out, and this is particularly true

when jaundice sets in rapidly, and becomes speedily intense. Catarrhal jaundice generally soon disappears. Of course when this symptom is due to obstructive organic disease, especially cancer, there is but little hope of its removal; but it is astonishing to what an extreme degree the discoloration may attain in some instances, without any proportionate general disturbance to support the idea that bile acts as a poison. Jaundice in connection with pregnancy is considered highly dangerous.

TREATMENT.—In general terms the management of cases of jaundice may be summed up thus:—1. To treat the condition upon which it depends; and to remove any obstruction to the flow of bile, if practicable. 2. To promote secretion of bile, if necessary, by remedies to be hereafter considered; or, on the other hand, to limit its formation. 3. To attend carefully to the diet, especially avoiding fatty and oily substances, as well as much starch, sugar, or alcoholic stimulants. 4. To treat the symptoms due to the absence of bile from the alimentary canal, especially constipation and flatulence; or to supply a substitute for this secretion, in the way of artificially prepared inspissated ox-gall, gr. v-x, given two or three hours after meals. 5. To promote the renal and cutaneous excretions. 6. To attend to the general condition, giving quinine, iron, and other *tonics*, as well as adopting hygienic measures for improving the health in chronic cases; treating adynamic symptoms by *stimulants*; low nervous symptoms by encouraging free elimination by the bowels, kidneys, and skin; and checking hæmorrhages by *astringents*. In cases of permanent obstruction, it has been proposed to make an artificial fistula into the gall bladder, having first excited adhesion with the abdominal wall by means of escharotics. The irritation of the skin may demand measures for its relief; alkalies with opiates or morphia internally, or the latter administered hypodermically, and warm or alkaline baths are most serviceable for this purpose. It must not be forgotten that the colour of jaundice remains for a time after any cause of obstruction has been removed; and if this has been effected, it is not necessary to continue further active measures. The removal of the bile from the system may be promoted by occasional *alkaline baths*, *aperients*, Cheltenham and other *mineral waters*; while convalescence is hastened by attention to hygienic and other measures which tend to improve the general health.

CHAPTER XXVII.

CONGESTION OR HYPERÆMIA OF THE LIVER.

ÆTIOLOGY.—*Active* congestion of the liver occurs to some degree during every period of digestion. As a morbid condition it is met with:—1. In consequence of *errors in diet*, particularly in those that take but little exercise, especially habitual excess in eating, or indulgence in too rich articles of food; and abuse of alcohol or hot condiments.

2. As the result of continued *exposure to excessive heat* in tropical climates; or of a *sudden chill* while heated. 3. In connection with malarial, yellow, relapsing, and other *fevers*. 4. *Vicarious* of menstruation; or, it is said, of habitual discharges, *e.g.*, bleeding from piles. 5. As the result of *local injury*. 6. Associated with *morbid deposits* in the liver. 7. In the early stage of *inflammation*.

Mechanical congestion is generally due to some condition of the heart or lungs which interferes with the general venous circulation; very rarely to local obstruction of the hepatic vein or inferior vena cava.

Passive congestion is said to follow habitual constipation; or to result from a torpid state of the portal system, due to paralysis of the coats of the vessels or any other cause.

ANATOMICAL CHARACTERS.—It is only the *mechanical* form of congestion of the liver that is generally seen after death. The organ is enlarged more or less, quite uniformly, its surface being smooth, and its capsule stretched. It often feels unusually firm. On section an excessive quantity of blood flows; the colour of the surface is unusually dark, sometimes even purple; and the vessels appear abnormally filled, becoming in time permanently dilated. The dark colour is rarely uniform, but is evident chiefly in connection with the infralobular branches of the hepatic veins, constituting the so-called *hepatic* congestion. *Portal* congestion is the term employed when the vessels at the circumference of, and between the lobules, are most distended, but this is rarely seen. The ultimate effects of long-continued mechanical congestion will be described in a subsequent chapter, but allusion may be made here to what is termed the *nutmeg liver*. This morbid condition is thus named owing to a section of the organ presenting a variegated appearance, resembling that of a nutmeg, there being a mixture of red, white, and yellow tints. It is observed after congestion from cardiac obstruction has lasted for some time, and depends essentially on the following pathological changes. The branches of the hepatic vein are distended and over-loaded, of a deep red colour, and well-defined; the circumference of the lobules corresponding to the portal branches is anæmic, and has undergone degenerative fatty changes, being consequently pale and opaque; while the bile is stagnant in many of the smaller bile-ducts, which accounts for the yellow tint.

SYMPTOMS.—Locally hepatic congestion tends to produce a sense of uncomfortable tension, fulness, and weight over the liver, especially after meals, and when lying on the left side; sometimes there is slight tenderness. There may be pain in the right shoulder. Slight jaundice is often present, but the stools contain bile. The spleen becomes enlarged in course of time in cases of mechanical congestion. Commonly the alimentary canal is deranged, as evidenced by impaired appetite, foul tongue, constipation or diarrhoea, and flatulence; but these symptoms are often the result of the same cause which originates the hepatic congestion, though they may be partly due to deficiency or unhealthy quality of the bile. Some degree of general disturbance often accompanies congestion of the liver. The urine is frequently deficient and concentrated, depositing abundant urates; it also commonly contains biliary pigments.

The *physical signs* of congested liver are moderate enlargement, liable to some variation ; regularity and uniformity in shape, as well as over the surface and margins ; with frequently somewhat increased firmness of the organ.

TREATMENT.—For active hepatic congestion the measures to be adopted are to remove its exciting cause, an *emetic* being useful if it is due to irritating articles of food ; to restrict the diet to small quantities of beef tea, milk, and such articles ; to apply warm poultices, fomentations, or sinapisms over the hepatic region, or to dry cup freely, or in some cases even to remove a little blood by leeching or cupping, or by applying a few leeches around the anus ; and to give a dose of calomel or blue pill, followed by a *saline aperient*, such as citrate of magnesia, sulphate with carbonate of magnesia, sulphate of soda, or cream of tartar. After the acute symptoms have subsided, alkalies with bitter infusions are useful, as well as *alkaline* and *saline mineral waters* ; subsequently the principles of treatment must be similar to those to be described hereafter as applicable to chronic hepatic diseases. These must also be followed in the management of cases of mechanical congestion.

CHAPTER XXVIII.

ACUTE INFLAMMATORY DISEASES OF THE LIVER.

I. CIRCUMSCRIBED OR SUPPURATIVE INFLAMMATION—HEPATIC ABSCESS.

ÆTIOLOGY AND PATHOLOGY.—The usual form of acute inflammation of the liver-tissue is that which ends in suppuration, and even this is rare, except in tropical climates. The cases of hepatic abscess met with in this country occur principally among sailors and others who have come from these regions. Murchison distinguished two forms of hepatic abscess, the *tropical* and the *pyæmic*, the latter occurring in temperate climates.

The causes of acute hepatic inflammation may be stated generally as follows :—1. Occasionally *direct injury* to the liver, or over the hepatic region. 2. *Convection of septic matters* from various parts of the body, either internal or external, the products of wounds, operations, abscesses, ulceration, or gangrene. The deleterious substances may come from any part, but hepatic abscess is especially liable to occur after ulceration or gangrene of the stomach or bowels ; as the result of operations affecting the alimentary canal ; and in connection with ulceration or suppurative inflammation about the bile-ducts or gall-bladder ; because under such circumstances the materials are immediately taken up by the portal system of vessels. Some authorities are of opinion that in these cases the disease originates in phlebitis, extending along the portal vessels to the liver. 3. Occasionally the softening and breaking-down of an *embolus* or *thrombus in the portal vein—suppurative pyle-phlebitis*—the particles being conveyed into the

liver, and originating an abscess there. 4. Rarely some *direct irritation* in the substance of the liver, *e.g.*, a suppurating hydatid-cyst; gall-stones; round-worms which have entered through the bile-duct; or foreign bodies. 5. The *ætiology* of *tropical abscess* requires special comment. It has been regarded by Budd and others as in all cases essentially *pyæmic*, resulting from previous dysentery. In some instances it is highly probable that this is the true pathology, but by no means in all, for often no sign whatever of dysentery can be discovered. There are two views as to the *exciting causes* of the hepatic inflammation in such cases:—*a.* That it is the direct consequence of *continued intense heat*, combined with *malarial influence*. *b.* That in addition to these influences, which induce a *predisposing* depraved condition of the system, there must be a *sudden chill* acting upon the body. Intemperance, excessive eating, and indolent and luxurious habits generally, act as powerful *predisposing causes* of hepatic abscess.

ANATOMICAL CHARACTERS.—The post-mortem examination in cases of acute hepatitis generally reveals that suppuration has been established. The disease is supposed to commence with active hyperæmia; followed by effusion of lymph and degeneration of the hepatic cells, causing the affected part to become swollen or prominent, paler, yellowish, and softened; then suppuration begins in points in the centre of the lobules, which gradually coalesce, forming abscesses of various sizes. The pus-cells are probably partly leucocytes; partly the products of endogenous multiplication of the liver-cells. The situation, number, size, and exact shape of the hepatic abscesses vary widely; as well as the nature and amount of their contents; and the condition of the surrounding tissue. The *right lobe* is much more frequently affected than the left. Important differences as to number and size are stated to characterize *tropical* and *pyæmic* abscesses respectively. In the former variety there is generally one large abscess, and rarely does the number exceed three; in the latter the separate accumulations of pus are very numerous and small, not often being above a hen's egg in size. My own limited experience of hepatic abscess would lead me to the conclusion that there are at least exceptions to this rule.

Originally hepatic abscesses are more or less rounded, but by coalescence and extension they often become very irregular. The contents generally resemble healthy pus at first, but in time they may become sanguineous, or altered by admixture of bile, or more or less foetid and decomposed. At first the walls consist of liver-tissue, usually congested or infiltrated, softened, and ragged; subsequently the boundary may become converted into a smooth firm capsule.

The progress and termination of these abscesses are also variable. When large, and especially when of the tropical variety, they advance towards the surface of the liver, finally bursting, either externally, or into the peritoneum, intestines, stomach, gall-bladder, hepatic duct, hepatic or portal vein, inferior vena cava, or pelvis of the right kidney; or, in rare instances, opening through the diaphragm into the pleura, lung, or pericardium. After the discharge of the pus, cicatrization may take place, causing contraction and depression of the surface of the liver. In some cases an abscess remains dormant for a considerable period, and then rapidly extends. It is also believed that the fluid

portion of the pus may be absorbed, the contents becoming first caseous, then putty-like, and finally calcareous, the tissue around forming a dense cicatrix.

The gall-bladder is sometimes inflamed in cases of hepatic abscess. The bile contained in it is frequently unhealthy, but presents no special characters. The consequences of the rupture of an abscess into various structures are described in other parts of this work.

SYMPTOMS.—As a rule the symptoms of hepatic inflammation are very pronounced. They are both *local* and *general*.

Local.—Pain and tenderness are generally complained of over some part of the hepatic region, often preceded by mere uneasiness. The pain differs much in its severity and characters; in most cases it is at first dull, aching, and tense, but usually increases when suppuration sets in, and may then assume a throbbing character; it is more marked when the inflammation is near the surface. Sympathetic pains about the right shoulder and scapula are occasionally present, but, it is affirmed, only when the upper surface of the right lobe is affected. In this event also a deep breath or cough aggravates the pain; while the breathing is hurried, short, and chiefly upper costal, there being likewise some feeling of dyspnoea, with in many cases a short dry cough. Jaundice is very uncommon in connection with tropical abscess, but some degree of it is frequently observed in pyæmic cases. Ascites is extremely rare, unless the inflammation depends on pyle-phlebitis, when signs of great obstruction of the portal vein are prominent, and this is an important matter in diagnosis. More or less disturbance of the alimentary canal is almost always observed, such as loss of appetite, furred and irritable tongue, thirst, nausea or vomiting, constipation or diarrhoea. The urine is at first very markedly febrile; after suppuration has been established it often becomes pale, copious, and deficient in urea.

Physical characters.—The liver is at first uniformly and moderately enlarged. Should the abscesses formed be small and deeply seated, nothing further can be observed; but if one or more of them become large and superficial, the following characters are presented:—1. The general enlargement increases considerably, and in addition a *bulging prominence* presents in some direction, or occasionally more than one. This is generally observed in the epigastrium or right hypochondrium; sometimes it causes distension of the lower part of the chest, with flattening of the spaces. 2. The general surface and margins of the liver usually feel *smooth* and *regular*, but occasionally, from the projection of several small abscesses, or on account of peri-hepatitis, they are *undulated* and *irregular*. 3. The local bulging soon yields a sensation of *elasticity*, and afterwards of *fluctuation*, gradually extending and becoming more perceptible, surrounded often by a ring of inflammatory induration. No hydatid-fremitus can be felt. 4. The *hepatic dulness* is *altered in outline* as well as in *area*, and when the abscess tends towards the thorax, this is often one of the chief signs noticed. 5. *Auscultation* may reveal *friction-sound* over an abscess, due to peritonitis. It may also indicate encroachment upon the limits of the chest by the liver; and interference with the expansion of the right lung. 6. By means of the *aspirateur* pus may be obtained, and this is highly im-

portant as a means of diagnosis in doubtful cases. I may mention that marked *pulsation* may be observed in connection with an hepatic abscess presenting in the epigastrium, conducted from the aorta, and simulating an aneurism. The spleen may be enlarged, but this is chiefly observed in pyæmic cases, and is not usually the direct result of the hepatic disease.

General.—Chills or rigors often usher in an attack of acute hepatitis, followed by more or less pyrexia, with considerable constitutional disturbance. Suppuration is usually indicated by repeated rigors; fever of a hectic type, not uncommonly remittent or intermittent, attended with abundant sweats; and much prostration and wasting. Ultimately typhoid symptoms are very liable to arise, ending in low nervous disturbance and death. The constitutional symptoms are as a rule more severe in pyæmic than in tropical cases.

COURSE AND TERMINATIONS.—The ultimate course of events will depend upon the progress of the disease. The symptoms may subside, and the abscess undergo retrograde changes, ending in a cure. Almost always, however, it tends to open in one or other of the directions already mentioned, and the corresponding symptoms may be readily gathered from a little consideration. When it approaches the surface of the body, the abscess causes redness, oedema, and the other signs of superficial suppuration before it bursts or is opened. Most cases of hepatic abscess prove fatal and are rapid in their progress, but tropical cases may last for six months or more; the pyæmic form is much the more fatal and speedy in its termination. Some cases go on for a long period, and ultimately recover, the abscess discharging its contents and cicatrizing.

II. PERI-HEPATITIS.

This term is applied to inflammation of the *covering of the liver* and of *Glisson's capsule*, which is not uncommon as an acute affection, associated with peritonitis or organic diseases of the liver; or resulting from injury, or from extension of inflammation from neighbouring parts. It is also said to arise from a chill. It leads to exudation, with consequent thickening, opacity, and adhesions; while occasionally pus is formed.

SYMPTOMS.—The symptoms are pain over the liver, sometimes sharp, increased by cough and deep breathing; with superficial tenderness; but no particular derangement of the hepatic functions, or alterations in the physical characters of the liver. There is usually more or less pyrexia. If the affection is chronic, or if repeated attacks occur, as not uncommonly happens in connection with syphilis or chronic heart diseases, signs of obstruction of the portal vein or bile-duct, and of atrophy of the liver may be established.

III. INFLAMMATION OF THE BILE-DUCTS.

Catarrh of the bile-ducts is by no means an uncommon affection, being especially met with in children, and in old gouty persons. Its chief

causes are extension of catarrh from the duodenum ; hepatic congestion ; irritation of the mucous membrane by gall-stones, parasites, foreign bodies, and perhaps by unhealthy bile, which may cause considerable inflammation ; and blood-poisoning in connection with fevers and other affections. The morbid appearances are similar to those of other forms of catarrh. Occasionally croupous or diphtheritic inflammation is observed in the bile ducts.

SYMPTOMS.—The symptoms of simple catarrh merely indicate more or less obstruction of the bile-duct, with consequent jaundice and enlargement of the liver and gall-bladder, this being generally preceded by signs of gastro-duodenal catarrh. There is often local pain and tenderness, with some degree of pyrexia. The duration and course of these cases vary, but generally they soon recover.

IV. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. **DIAGNOSIS.**—The occurrence of acute local symptoms connected with the liver, accompanied with constitutional disturbance, should lead to the suspicion of inflammation of this organ, especially in tropical climates, or if there is any obvious cause of pyæmia. At first there may be considerable difficulty in distinguishing inflammation from mere active congestion ; and also in separating the different kinds of inflammation from each other, especially *suppurative hepatitis* and *perihepatitis*. When pus forms, this is generally revealed by evident *physical signs* ; as well as by increased constitutional disturbance. Commonly, however, distinct objective indications of pyæmic abscesses are wanting. The differences between *pyæmic* and *tropical* abscess have already been alluded to. The chief conditions which may be mistaken for abscess in the liver are inflammation and suppuration of the gall-bladder ; a suppurating hydatid-cyst ; and abscess in the abdominal parietes. Local peritonitis may simulate hepatitis.

2. **PROGNOSIS.**—In the milder forms of hepatic inflammation the prognosis is generally favourable, but when suppuration occurs it is very serious. It will then depend mainly on the size and probable number of the abscesses ; the direction in which they open, Maclean stating as his experience that the largest number of recoveries follows bursting into the lung, and then into the intestine, and that the prognosis is much more favourable when the abscess points at the ensiform cartilage than in an intercostal space ; the general condition of the patient ; and whether the liver-affection is or is not associated with some other morbid state, such as dysentery. *Pyæmic* abscesses are very fatal.

3. **TREATMENT.**—The slighter forms of hepatitis may be treated in the same manner as active congestion. Much difference of opinion is held as to the management of tropical abscess in its early stage. The usual measures recommended are venesection, or local bleeding by leeches or cupping ; constant poulticing or fomentations ; the use of *saline purgatives* ; and the administration of calomel. Dr. Maclean, who strongly opposes bleeding and mercury, advocates the free employment of ipecacuanha, as in dysentery. Tartar emetic and tincture of

aconite have also been used. With regard to pyæmic abscess, there can be no question but that the severe lowering measures mentioned above are most injurious in this form of the disease. When suppuration occurs, poultices and fomentations must be assiduously applied. The question of *opening abscesses* connected with the liver is one which is also much discussed. Most authorities seem to be in favour of operating; some prefer leaving the abscess to take its own course, on account of the dangers of peritonitis, decomposition from entrance of air, hæmorrhage, or gangrene. If there is satisfactory evidence of the existence of a single abscess, it appears to me certainly advisable to evacuate the pus, and even in doubtful cases the aspirateur may be advantageously employed. When there are several collections of pus, as in pyæmia, operative interference is contra-indicated. The different modes of evacuation advocated are by means of the *aspirateur* or a *small trochar and canula*; by *free incision*; or by the application of *caustic potash* so as to produce a slough, this being also used to excite adhesions to the abdominal wall. The air should be as carefully excluded as possible, and carbolic acid freely used. In the case of a moderate-sized abscess, it seems best to let out all the pus at once, and to leave a canula or drainage-tube in; when very large, it may be emptied gradually by successive operations. Large poultices should be afterwards applied, being very frequently changed, and *antiseptics* must be freely used, the patient lying as much as possible in that position most favourable for the escape of the pus. It is useful in some cases to wash out the abscess with weak carbolic acid. In the early period of the disease the diet should consist of milk, beef-tea, and such articles; when suppuration is set up it should be as nourishing as possible, while *stimulants* are called for at this time, as well as quinine, mineral acids, or tincture of steel. *Narcotics* are often required; and various symptoms demand attention in many cases. The general treatment applicable to pyæmia is indicated in pyæmic cases.

CHAPTER XXIX.

ACUTE YELLOW ATROPHY.

ÆTIOLOGY AND PATHOLOGY.—The causation of this rare hepatic disease is very uncertain. Most cases occur in connection with pregnancy, but the complaint has also been attributed to severe nervous disturbance from depressing emotions; to blood-poisoning in cases of typhus, scarlatina, and other fevers; to malarial influence; or to the production within the body of some special poison, the product of faulty digestion or assimilation. The chief *predisposing causes* mentioned are age, the disease being almost always observed before forty, but never in childhood; the female sex; intemperance; venereal excesses; and syphilis.

As regards its *pathology*, most authorities consider acute atrophy as

being the consequence of *diffuse parenchymatous inflammation of the liver*, excited by the action of some morbid poison. It has also been attributed to obstruction of the smaller bile-ducts; or to excessive formation of bile within them, whereby pressure is exercised on the surrounding structures.

ANATOMICAL CHARACTERS.—The obvious characters presented by the liver in acute atrophy are marked diminution in its size and weight; relaxation and softening of tissue; change in colour to a dull yellow; and disappearance of all traces of lobular divisions. The organ may be reduced to half its ordinary bulk or even less, being especially diminished in thickness, and it lies out of sight at the back of the abdomen, shrunken and flaccid, while the peritoneum covering it is lax, and is often thrown into folds. In parts where the disease is less advanced, hyperæmia and a greyish exudation have been described. Microscopic examination reveals fatty degeneration and destruction of the gland-cells, until ultimately nothing remains but a granular detritus, oil-globules, and pigment. There is only a little mucus in the gall-bladder and bile-ducts as a rule. Extravasations of blood in the alimentary canal and other parts, with ecchymoses, are not uncommon. The spleen is generally enlarged. The kidneys exhibit degeneration of, and deposits of pigment in, the epithelium-cells. Leucine and tyrosine are found in the blood; as well as in the tissues of the liver, spleen, and kidneys.

SYMPTOMS.—There may or may not be *premonitory* symptoms indicative of gastro-enteric catarrh, or general uneasiness and painful sensations may be experienced, but there is nothing characteristic about these phenomena. Slight jaundice is usually soon observed, and afterwards increases, but seldom becomes intense, and it may be limited to the upper part of the body. It has been attributed to blocking-up of the smaller ducts by the debris of the cells. Among the ordinary symptoms of acute atrophy are pain and tenderness over the epigastrium and right hypochondrium, vomiting, and constipation. There is not much pyrexia, but the pulse is often hurried and is liable to much variation, while the temperature is considerably raised in some cases towards the close.

The most striking clinical phenomena in this disease, however, are:—1. Those significant of the *typhoid state*, with prominent nervous symptoms. 2. Great diminution or complete disappearance of the hepatic dulness. 3. Generally enlargement of the spleen. 4. Peculiar changes in the urine. 5. Hæmorrhages into various parts. The nervous symptoms consist at first of headachic, great depression, languor, irritability, and restlessness; speedily followed by low delirium, stupor, coma, twitchings, and convulsions, with involuntary discharge of fæces and urine. At the same time the tongue becomes brown and dry, with sordes on the teeth. The urine yields considerable quantities of leucine and tyrosine; while urea, uric acid, and salts are much diminished, being sometimes almost entirely absent; some bile-pigment is usually present, and often a little albumen or blood. Hæmorrhage most frequently takes place into the stomach and bowels; cutaneous petechiæ and vibices are not uncommon, and in rare instances uterine hæmorrhage or epistaxis occurs. The *course* of the disease is generally

very rapid ; and the *termination* almost invariably fatal. When acute atrophy arises in the course of pregnancy, it leads to miscarriage or abortion.

DIAGNOSIS.—At first it is difficult to diagnose acute atrophy of the liver, but once the symptoms are fully developed, and the physical signs indicative of diminution in the size of the organ become evident, the nature of the disease is plainly revealed.

PROGNOSIS is very grave, the disease almost always ending fatally.

TREATMENT.—Free purgation ; promotion of the action of the skin by hot air or vapour baths ; the administration of diuretics ; blistering and leeching the head ; and the use of cold douches have been the chief measures recommended in the treatment of acute atrophy of the liver, but they are of little service when the disease is established. Hæmorrhages and other symptoms must be treated as they arise.

CHAPTER XXX.

CHRONIC DISEASES OF THE LIVER.

I. HYPERTROPHY AND ATROPHY.

A SIMPLE *hypertrophy* of the hepatic tissue is said to be observed in some cases of leucocythæmia ; very rarely in diabetes ; and as the result of prolonged residence in hot climates. Clinically it is indicated by a slow, moderate, and uniform enlargement of the liver ; without any evident symptoms, either local or general.

On the other hand, *atrophy* generally occurs in old age ; or it may result from starvation ; or from pressure upon the surface of the organ by tight stays, peritoneal adhesions, and other conditions.

II. FATTY LIVER—HEPAR ADIPOSUM.

ÆTIOLOGY.—This affection belongs to the *fatty infiltrations*, the secreting cells of the liver becoming filled with oil. The conditions under which it is usually met with are :—1. In connection with phthisis and other *wasting diseases*, such as cancer, gastric ulcer, or chronic dysentery. 2. In *chronic lung and heart affections*, which lead to imperfect aëration of blood. 3. As the result of *over-feeding*, especially excessive consumption of hydro-carbonaceous substances ; and *abuse of alcohol*, particularly in the form of ardent spirits. Deficient exercise and indolent habits aid greatly in the development of the disease under these circumstances. Some individuals are much more predisposed to fatty liver than others. *Fatty degeneration* of the hepatic cells may be set up in connection with other morbid conditions of the liver, such as albuminoid disease or cirrhosis.

ANATOMICAL CHARACTERS.—In well-marked fatty liver the morbid

characters include enlargement and increase in weight, though the specific gravity is diminished, the margins of the organ being thickened and rounded, and the surface quite smooth; a more or less yellow colour, with opacity, both externally and on section, this being generally mottled with red; softening of the tissue, which has a doughy, inelastic feel, pits on pressure, and readily breaks down or tears; anæmia, but little blood escaping from the cut surface; loss of distinctness of outline of the lobules; and evidence of the presence of much fat, obtained either by the knife, by blotting-paper, or by ether. The liver may yield as much as from 43 to 45 per cent. of oily matters, which consist of olein and margarin, with traces of cholesterin. Microscopic examination shows enlargement of the cells, which also become spherical, and are more or less loaded with fat. In the less advanced cases the change is only revealed by the aid of the microscope. It is found that the morbid process extends from the circumference of the lobules towards their centre.

SYMPTOMS.—As a rule there are no evident symptoms connected with the liver in fatty disease. Dyspeptic disturbances are common. *Physical examination* is the only positive means of diagnosing fatty liver:—
 1. There is enlargement in a downward direction, slow in its progress, and usually moderate in degree, the organ never attaining any great size. 2. The shape is quite normal; and the surface and margins are smooth and regular, the latter feeling rounded. 3. Palpation often reveals a soft, doughy consistence of the tissue. The *general* symptoms are frequently those associated with fatty changes, namely, want of tone; inaptitude for exertion; pallor and pastiness of the skin. Signs of fatty changes in other organs and tissues, such as the heart, vessels, and kidneys, may be observed.

III. ALBUMINOID, LARDACEOUS, OR WAXY LIVER.

The *ætiology* and *pathology* of this morbid condition have already been considered (Vol. i., pages 74–77). The liver is one of the most common seats of albuminoid disease.

ANATOMICAL CHARACTERS.—Commonly the size and weight of the liver are considerably increased, as well as its specific gravity. The shape is scarcely altered, but the organ is somewhat flattened, with rounded edges. The surface and margins are quite smooth; the peritoneum is stretched; and the tissue feels very firm and resistant. On section the usual pale, anæmic, dry, greyish, and glistening aspect characteristic of lardaceous disease is observed; often the surface is quite homogeneous, without any trace of lobules, or these may appear to be enlarged. The ordinary chemical tests characteristic of the albuminoid material are yielded; and microscopic examination reveals its presence in connection with the vessels and cells. It is first observed in the middle zone of the lobules, where the branches of the hepatic artery are distributed. The exact appearances may be modified by the association of other morbid conditions with the albuminoid disease, such as fatty degeneration, cirrhosis, or syphilitic cicatrices. Commonly other organs are involved at the same time.

SYMPTOMS.—As a rule hepatic symptoms are not prominent. Local sensations rarely amount to more than a feeling of weight, tension, and discomfort. Jaundice and signs of obstruction of the portal circulation are also very uncommon, and when present are due either to pressure by enlarged glands in the portal fissure, or by thickenings in connection with local inflammatory changes; or ascites may result from chronic peritonitis, or from constitutional debility and anæmia. The *physical signs* of albuminoid disease are:—1. Enlargement, chiefly in a downward direction; gradual in its progress, the liver frequently attaining great dimensions at last, so that it presents a visible prominent tumour. 2. No perceptible alteration in form, the surface being smooth and uniform, with rounding of the margin. 3. Consistence dense and resistant, often extremely hard. There are the usual *general* symptoms indicative of albuminoid disease; with, in most cases, signs of implication of other organs; as well as of the existence of some constitutional condition, with which the disease is associated.

IV. HYDATID TUMOUR OF THE LIVER—ECHINOCOCCUS HOMINIS— ACEPHALOCYST.

ÆTIOLOGY AND PATHOLOGY.—The best illustration of the morbid conditions resulting from the development of the embryo of a tape-worm in the human body is afforded by the complaint now under consideration; and though the parasite may be met with in almost every organ and tissue in the body, yet the liver is by far its most frequent seat, so that the subject may be discussed once for all in the present chapter. A *hydatid tumour* is derived from the development of embryos of the *tænia echinococcus*, each of which produces a *scolex*, named *echinococcus hominis*; and these scolices become enclosed in cysts. This variety of tape-worm infests dogs and wolves, and it is supposed that fragments are evacuated in their excreta, the ova of which are subsequently set free, become mixed with water or food, and are thus introduced into the alimentary canal of a human being. When the embryos are liberated, they bore the walls of the stomach with their hooks, and then migrate, usually settling in the liver, and there developing into scolices. The *echinococcus* also infests sheep, and it is in consequence of eating their organs which are the seat of this parasite, that dogs become the subjects of tape-worm.

Iceland is the country in which hydatid disease is especially prevalent. In this part of the world it is only very exceptionally met with, and usually in persons who have been abroad. Most cases occur during middle life; and among the poorer classes.

ANATOMICAL CHARACTERS.—In the first place it will be well to describe the various structures which ordinarily enter into the formation of a typical *hydatid tumour*:—1. Externally there is a firm, whitish or yellowish, fibrous, vascular capsule, the result of proliferation of cellular tissue from irritation, which is adherent to the surrounding structures. 2. Within this, moulded as it were to its interior, but easily separated from it, is a delicate cyst or bladder, elastic, greyish, semi-transparent or gelatinous in aspect, and compared to boiled white of egg; under

the microscope this is seen to consist of several hyaline, concentric layers, a section presenting a characteristic laminated appearance. (Fig. 17.) The most internal layer is extremely delicate, and is studded with minute transparent cells. The term *mother-sac* or *vesicle* is usually applied to this structure as a whole; but it has also been limited to the internal lamina just mentioned, which has likewise been termed the *germinal membrane*. 3. A quantity of fluid is contained within this cyst, usually completely filling it, perfectly colourless, transparent, and watery as a rule, occasionally slightly opalescent; of low specific gravity—1007 to 1009; generally alkaline or neutral in reaction, but occasionally acid; and consisting mainly of a strong solution of chloride of sodium, without any albumin or other organic substance, but said to contain succinate of soda. 4. Floating in this fluid, or attached to the inner surface of the mother-cyst when small, are numerous *secondary* or *daughter-cysts*; in some instances these amount to hundreds or thousands, and completely fill the space, so that there is little or no fluid, and they become flattened by mutual pressure; each daughter-cyst has precisely the same structure as the mother-sac, and within the

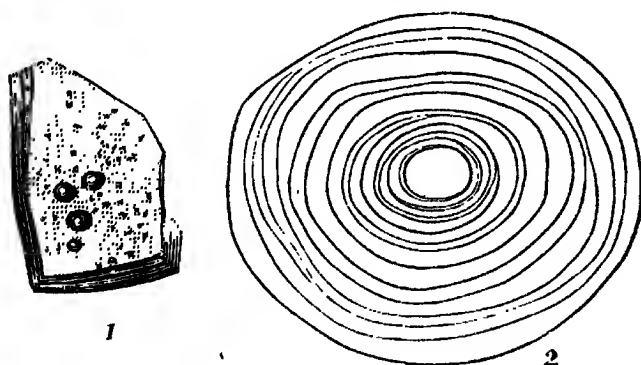


FIG. 17.*

larger of them there may be a third generation, and, rarely, a fourth is observed. 5. When the walls of the sacs are examined carefully, little whitish opaque spots are visible on the inner surface, which are the scolices of the *echinococcus* in various stages of development, usually arranged in groups or clusters, but occasionally single. These may also be free in the fluid, rendering it somewhat opaque. Each scolex is very minute, measuring from $\frac{1}{20}$ th to $\frac{1}{8}$ th of a line in length, but the length and form vary, according as the head is retracted into the body or extruded. (Fig. 18.) The head (Fig. 19) presents a proboscis, four suckers, with a double circle of characteristic curved hooks, which are movable and of unequal length (Fig. 20); a constriction separates it from the body, the latter being striated longitudinally and transversely, and presenting posteriorly a depression with a pedicle, by which the

* Fig. 17.—Hydatid found in man. 1. A fragment of the natural size; at its edge are shown the layers of which it is composed; on the external surface are several hydatid germs of different periods of development. 2. One of the germs flattened and magnified forty times, showing the stratified layers.

animal is fixed to the sac in its early condition. Numerous round and oval calcareous particles are imbedded in the tissue.

In most cases there is but a single tumour as above described, but sometimes two or more are found, though one generally predominates over the others. The size varies extremely, and a hydatid growth may attain such dimensions as completely to fill the abdomen, and even to encroach upon the chest. The daughter-cysts usually range from a millet-seed to an egg in size, but subsequent generations are very minute. Originally the shape tends to be spherical. The right lobe of the liver is the most frequent seat of hydatid tumour, but it may occupy any part of the organ, being either deep in its substance or superficial. If the hydatids are numerous, large, or superficial, they necessarily alter more or less the dimensions and form of the liver, giving rise to prominences. The surrounding hepatic tissue is often atrophied and compressed; sometimes the healthy portion becomes hypertrophied. Peritonitis may be excited over the tumour, giving rise to thickening and adhesions.

The events which are liable to happen in the course of hydatid disease are important, and may be summed up as follows:—1. The tumour enlarges, displacing adjoining structures and interfering with their functions, until it finally bursts in some direction, or is ruptured by violence or in some other way. The opening may take place externally through the abdominal or lower thoracic wall; into either pleura or lung, especially the right, which is the most common direction; the pericardium rarely; the peritoneum; the stomach or intestines; the gall-bladder or the bile-ducts; the hepatic vein or inferior vena cava. 2. Inflammation and suppuration sometimes occur, either spontaneously from rapid

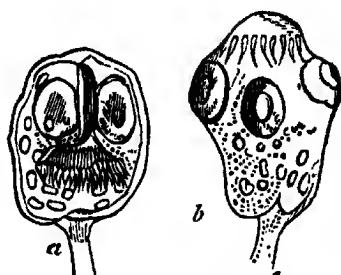


FIG. 18.*

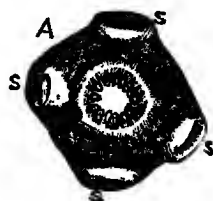


FIG. 19.†

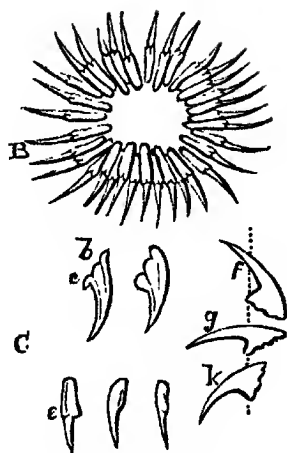


FIG. 20.‡

* Fig. 18.—Two *Echinococci* from a hydatid tumour. The one (a) has the head retracted within the vesicle; the other (b) has the head extruded.

† Fig. 19.—(A.) An *Echinococcus* viewed transversely, the head being directed towards the observer; s, s, suckorial discs.

‡ Fig. 20.—(B.) The circle of hooklets seen upon its under surface; thirty-four in number, seventeen long and seventeen short. (C.) b, c, Lateral views of the separate hooklets—b, the base; c, the central extremity or bifid process of the base; e, hooklets viewed upon the concave or inferior border; f, g, k, a diagram illustrating the movements and position of the hooklets.

growth ; from injury or operation ; or from the entrance of bile. 3. If the hydatid is slow in its progress, it not uncommonly undergoes degenerative processes as it advances in age, and these may ultimately bring about a spontaneous cure. The entrance of bile is supposed sometimes to induce this result. The outer capsule then becomes much thickened, firm, irregular, opaque, and ultimately calcified partially or completely. This impedes further growth, and the contained hydatids compress each other, shrivel and dry up, and finally die. The fluid also thickens and becomes opaque ; and, in short, fatty and calcareous degeneration takes place throughout, until there only remains a putty-like *débris*, in which shreds of the vesicles and hooklets of the echinococci are imbedded, revealing the nature of the mass. *Hæmatoidine* crystals are often found in it, as well as usually much *cholesterin*. A cicatrix-like depression may finally be left. 4. Occasionally cysts are found in which there are no echinococci. The name *acephalocyst* has been applied to this condition, and it has been regarded as an abortive or sterile form of the parasite, in which development is arrested ; or as an earlier stage of its growth.

Allusion may be briefly made here to a very rare form of this disease, named *multilocular hydatid-cyst*. The liver is found occupied by a mass, in some cases as large as a child's head or even larger, consisting of a stroma of cellular tissue, usually altered considerably by fatty degeneration, in which are imbedded cells or alveoli of various sizes, enclosing a gelatinous substance, in which microscopic examination reveals fragments of the laminated membrane of hydatids, hooklets, or occasionally even perfect scolices, as well as abundant calcareous particles. The centre of this mass is very liable to undergo suppuration, thus altering its characters considerably. This arrangement of the tumour has been attributed to the embryos having been deposited in the lymphatics, blood-vessels, or ducts of the liver ; or to the absence or early rupture of the external fibrous cyst, so that the parasites are able to grow and migrate in various directions, and may thus enter the different vessels.

Other organs and tissues are not uncommonly the seat of hydatid tumour along with the liver.

SYMPTOMS.—In general terms the ordinary clinical history of hydatid tumour of the liver may be summed up in the absence of morbid sensations referable to this organ ; of any interference with its functions ; or of constitutional disturbance : while the liver presents a peculiar form of enlargement. The disease may be latent from first to last. Should the growth attain a great size, a sense of local fulness and tension is often felt ; and in rare cases jaundice or signs of portal obstruction arise, in consequence of pressure upon the bile-ducts or portal vein, or because these vessels become blocked up by hydatids. Surrounding structures may also be interfered with, especially the diaphragm and respiratory organs. Should the cyst rupture, the consequent symptoms depend on the direction in which this takes place, being in many instances very grave. If the opening is external or into the lungs, characteristic structures may be discharged. The occurrence of suppuration is indicated by the ordinary local and constitutional signs of hepatic abscess.

The *physical signs* of hydatid tumour demand particular attention.

1. The liver is increased in size, and this is generally the first thing which attracts notice. The growth is as a rule very chronic and imperceptible in its progress, but finally the tumour may attain enormous dimensions, so as to give rise to a general enlargement of the abdomen, or it may encroach upon the chest, causing the right side to bulge.
2. The form of the liver is altered, as evidenced by palpation and percussion; while there is often an evident tumour in some part, especially the epigastrium or right hypochondrium. Smaller prominences are sometimes felt along the margins or surface of the organ, causing lobulation and irregularity.
3. Any prominent hydatid tumour generally feels quite smooth, and more or less elastic or fluctuating.
4. Hydatid-fremitus is often elicited very clearly.
5. In any doubtful case it is justifiable to make an exploratory puncture with the aspirateur, and thus to remove some of the fluid, the physical and chemical characters of which are quite characteristic. Perhaps some of the microscopic structures might come away at the same time.

It must be remarked that the signs above described are modified considerably by the degenerative and other changes which are liable to occur in a hydatid cyst. The outer wall may feel hard and bony. If a case only comes under observation when the abdomen presents a general enlargement, it is by no means easy in many instances, except by the history, to make out where the growth originated.

The *multilocular cyst* is said to be distinguished by being nodulated, hard, and tender; by jaundice, ascites, and enlargement of the spleen being usually present; and by the tendency in the tumour to inflame and suppurate. This variety may run a very rapid course.

V. CANCEROUS AND OTHER GROWTHS.

ÆTIOLOGY.—The liver is one of the most frequent seats of internal cancer, which may be either *primary* or *secondary*, the latter especially occurring after cancer of the stomach. The disease has sometimes been attributed to injury. Most cases are met with between 50 and 70 years of age, the affection being extremely rare before adult life. In some patients there is a hereditary taint. Dr. Walshe states that hepatic cancer is more common among males, and such has been my own experience.

ANATOMICAL CHARACTERS.—Ordinarily hepatic cancer assumes the form of distinct *nodules* or *tuberous masses*, having characters intermediate between those of scirrhus and encephaloid, approaching more towards one variety or the other in different instances. There is a wide difference as to size and number, the nodules being small at first, and gradually enlarging until they may ultimately reach the dimensions of a child's head, or even attain a larger size than this. Commonly several are found, unequal in size, and by their coalescence considerable tracts of the organ are sometimes involved. Originally the shape is spherical, but when the masses reach the surface they become flattened or even depressed in the centre, so as to present shallow concavities or *umbilications*. As a rule they are not separated from the

surrounding tissue by any definite structure, but occasionally a distinct cyst exists around a cancerous mass. Generally the consistence is moderately firm, but it may range from that of a soft, brain-like, semi-fluctuating substance, to that of a hard, cartilaginous tissue, and the amount of cancer-juice which can be expressed will vary accordingly. The colour of a section is in most cases white or yellowish-white, but more or less dotted and streaked with red, on account of the vessels present; it may, however, be extremely vascular and dark-red, resembling "fungus hæmatodes." The proportion of cancer-cells and fibrous stroma in any mass, as observed under the microscope, depends on the variety to which it belongs.

The liver is usually enlarged in proportion to the number and size of the growths, being often extremely large and heavy, as well as irregular in shape. Its tissues are more or less destroyed and compressed; the vessels and ducts are encroached upon or obliterated; and as a consequence jaundice and signs of obstructed circulation are often present. Sometimes thrombosis occurs in the portal branches or trunk. New vessels are developed, originating in the hepatic artery. Some observers describe the cancer as beginning in the centre of the lobules; others in the interlobular tissue. When a mass reaches the surface it excites localized peritonitis, with consequent thickening and adhesions. Neighbouring tissues may be involved by extension; and the lymphatic glands in the portal fissure are often implicated.

The growth of hepatic cancer is sometimes extremely rapid, especially when it is of the soft variety. Certain changes are liable to occur. The vessels of encephaloid cancer often give way, leading to extravasations of blood into its interior, which afterwards undergo changes, thus giving rise to unusual appearances. Very soft accumulations have been known to burst into the peritoneum in rare instances. Degenerative changes frequently arise in the less rapid forms, in the way of caseation; or of atrophy with contraction, induration, and the formation of a firm cicatrix. A section frequently presents a reticulated appearance, owing to fatty degeneration having taken place.

In exceptional cases hepatic cancer is *infiltrated*, and the organ may be smaller than usual, as well as diminished in weight. Melanosis, cystic cancer, and colloid have been extremely rarely met with in the liver. More recent and careful observation has shown that some of the morbid growths generally regarded as being of a cancerous nature, are composed of spindle-celled sarcoma. Cysts derived from obstructed bile-ducts, and erectile tumours have also been described in the liver.

SYMPTOMS.—Hepatic cancer is in the great majority of cases characterized by marked local disturbances, but the disease may be latent. At first merely a sense of discomfort and weight is experienced, soon, however, increasing to distinct pain and tenderness, which local sensations frequently become very severe, especially if the growth of the cancer is rapid, or if peritonitis is excited. The pain is often lancinating, shooting either towards the back or shoulders, or over the abdomen. Jaundice and ascites are also common symptoms, being usually the result of obstruction of the main ducts and vessels, in consequence of pressure exerted upon them by projections from the liver, or by glands in the portal fissure; ascites may also be associated with

chronic peritonitis. Once jaundice sets in, it is usually persistent, and often becomes intense, but it may be temporary from catarrh of the ducts. The spleen is but rarely enlarged. The superficial abdominal veins are sometimes distended.

The *physical characters* of the liver indicative of cancer are :—1. Enlargement, frequently very great, rapid in its progress, and chiefly increasing in a downward direction. 2. Alteration in shape and irregularity of outline, nodules or larger masses being felt, or sometimes even seen along the surface and margins, which nodules are not uncommonly umbilicated. 3. As a rule considerable firmness and resistance of the projections, though they occasionally have a soft elastic feel, or even yield a sensation of obscure fluctuation. 4. Occasionally friction-fremitus and sounds during breathing, these being chiefly due to peritonitis.

Digestive derangements are necessarily present in most cases, and they frequently first attract attention. The cancerous cachexia is usually well-marked, being accompanied with rapid wasting, debility, and anæmia. There may be pyrexia from time to time, which is sometimes considerable when the progress of the disease is rapid. Cancer is frequently present in other organs, either as a primary or secondary formation, especially in connection with the alimentary canal.

The *progress* of hepatic cancer is generally very rapid, and the disease is rarely prolonged beyond a year.

Other forms of tumour in the liver generally give rise to no definite symptoms, but they might possibly be detected on physical examination, or might give rise to local symptoms due to pressure.

VI. CIRRHOSIS OF THE LIVER—CHRONIC ATROPHY.

ÆTIOLOGY AND PATHOLOGY.—Undoubtedly several distinct morbid conditions of the liver have been included under the term *cirrhosis*, which have totally different modes of origin. With regard to the genuine disease, it is usually considered as resulting from a *chronic interstitial inflammation*, extending into the minutest portal canals, and leading to proliferation of cellular tissue between the lobules; or, as some pathologists describe, to the formation of an exudation, which undergoes organization and then contracts, with consequent pressure upon and obliteration of the vessels, and atrophy of the secreting elements. Some authorities have attributed cirrhosis to a *constitutional diathesis*, characterized by the formation of a fibroid tissue in different organs and structures of the body, of which the morbid change in the liver constitutes but a local development. While still others have regarded the disease as commencing in *degeneration and destruction of the secreting cells*, the ducts, vessels, and arcolar tissue remaining, this process being followed or not by proliferation of the last-mentioned. The important *exciting cause* of cirrhosis is *abuse of alcohol*, and especially indulgence in ardent spirits on an empty stomach. Hence the common name—*gin-drinker's liver*. The alcohol being absorbed, and afterwards circulating through the liver, is considered either to set up inflammation, or to lead to degeneration of the cells, according to the view held as to the pathology of the disease. Cirrhosis, however, is certainly occasion-

ally met with where there is no history of intemperance, and it has then been attributed to the influence of malaria or prolonged heat; to the abuse of hot condiments and various articles of diet; to the circulation of products of faulty digestion; or to the extension of a localised peritoneal inflammation. Cases have come under my notice which could not be traced to any definite cause, and it has appeared to me that occasionally there may be some hereditary influence at work. The complaint is chiefly met with between 30 and 50 years of age, being rare in youth, and not common in advanced life. There is no doubt, however, but that cirrhosis of the liver may be met with even in young children, of which a striking example was brought before the Pathological Society by Dr. Griffiths of Swansea. Males suffer more than females; and also those persons who, from their occupation or in any other way, are more exposed to the ordinary exciting cause of the disease.

ANATOMICAL CHARACTERS.—In the advanced stage of cirrhosis the morbid appearances are very characteristic. The liver is greatly contracted, wasted, and diminished in weight, being sometimes reduced even to $\frac{2}{3}$ or $\frac{1}{2}$ the normal, especially the left lobe and edges, the latter being often merely a thin fibrous rim. The general form is frequently somewhat rounded. The surface is very pale, and is covered more or less with roundish prominences, varying in size from minute granules to projections or knobs measuring $\frac{1}{4}$ to $\frac{1}{2}$ an inch or even more in diameter, like hob-nails—hence the names *granular* or *hobnailed liver*. They may be tolerably uniform in size, but are more commonly unequal. Local puckering or depressions are also often observed. The capsule is thickened, opaque, and inseparable; while local peritoneal adhesions and thickenings are almost constant. The consistence is remarkably dense, firm, tough, and leathery as a rule, which is best realized on making a section. This exhibits the same granular appearance as the surface, and sometimes in a much more marked degree. The colour is generally a mixture of dirty-white or greyish and yellow; the former being arranged in lines or bands of different widths, sometimes extending over considerable tracts; the latter, which varies in exact tint, being in some specimens bright-yellow, in others almost brownish, corresponding to the granulations. The name *cirrhosis* is derived from this yellow appearance. In extreme cases, however, but little of this colour is evident.

The intimate changes in structure, and the microscopic appearances must now be considered. The *white tissue* is generally supposed to be made up mainly either of fully-developed fibrous tissue; or of young connective-tissue elements in process of development, and chiefly resulting from proliferation. It has, however, been described as consisting in some instances of the remains of the vessels, ducts, and other tissues which have not undergone destruction. Generally this material presents numerous new vessels running through it, which are stated by Frerichs to be derived from the hepatic artery. The *yellow nodules* correspond to lobules or groups of lobules which have not yet undergone complete disintegration. The colour is chiefly due to stasis of bile, owing to pressure upon the minute ducts; it partly results, however, from fatty degeneration of the cells. A large proportion of these

cells have become wholly destroyed, and most of those which remain are greatly altered, appearing shrunken or fatty, or containing pigment-granules. The degeneration begins at the circumference of the lobules, and extends towards their interior. The *vessels* also present important changes. Many of the smaller branches of the portal vein are compressed or obliterated, and its capillaries are destroyed, so that injection of them from the main trunk is impossible. This trunk and the larger branches are often dilated, and may be occupied by thrombi. Sometimes a considerable branch of the vein is compressed. The hepatic artery is also commonly dilated, and new capillaries form in the fibrous tissue; frequently black pigment is found in its branches. The chief divisions of the hepatic vein are not altered, but many of its capillary tributaries are obliterated, and the communications between this vessel and the portal system are more or less destroyed. The remaining capillaries are commonly in a state of fatty degeneration.

The degree to which the changes just described are observed necessarily differs considerably according to the stage of the disease. In the earliest condition there can be no doubt but that the liver is enlarged, which is proved rather by clinical observation than by *post-mortem* examination. At this time the granular appearance is absent or but slightly marked; while the entire organ is congested, and is described as being occupied by a succulent, vascular, greyish material, consisting of young connective-tissue elements. In exceptional instances, however, a cirrhotic liver is enlarged throughout, and even to a marked degree, of which I have met with some striking examples. This is generally due to fatty or lardaceous disease being associated with the cirrhosis, but not always, there being in some cases merely a hypertrophic interstitial hepatitis.

The effects of cirrhosis outside the liver are highly important, and are visible on *post-mortem* examination, being mainly those already mentioned as resulting from obstruction of the portal circulation. Considerable anastomoses form between the hæmorrhoidal veins; and also between the superficial branches of the portal vein in the liver and the veins of the diaphragm and abdominal walls, through the peritoneal adhesions, and along the suspensory ligament.

Changes similar to those observed in cirrhosis of the liver are not infrequently met with in other organs and tissues at the same time.

A brief account will now be given of certain other forms of *chronic atrophy* of the liver:—

1. As the result of long-continued *mechanical congestion from heart disease*, the liver contracts and presents characters much resembling those of true cirrhosis, but there is an important difference, and the atrophy is rarely so marked as in the latter disease. It results from pressure of the distended tributaries of the hepatic vein upon the contiguous cells, causing their degeneration; hence the *centre* of the lobules becomes first wasted and depressed, while the circumference remains and forms granulations. Ultimately extensive depressions are produced, and more or less proliferation of connective-tissue occurs. Attacks of *chronic peri-hepatitis* are also common, which increase the tendency towards atrophy of the organ.

2. Dr. Murchison described a form of *granular atrophy*, generally independent of intemperance, in which the fibrous tissue is not increased, and the liver is softer than in health.

3. Atrophy may result from *adhesive pyle-phlebitis*, in consequence of which the trunk or some of the branches of the portal vein are obliterated. Cicatricial retractions are observed on the surface, with corresponding indurations.

4. Another form of atrophy of the liver is that due to chronic or repeated attacks of *peri-hepatitis*, which induces thickening of the capsule, or causes pressure upon the vessels, while fibrous bands pass into the interior, but there is no granular appearance.

5. Syphilis not uncommonly leads to atrophy of the liver, either by exciting *peri-hepatitis* or simple *interstitial hepatitis*; or as the result of changes in *gummatous deposits*.

6. The last variety is named *red atrophy* by Rokitansky, or *chronic atrophy* by Frerichs. It may be associated with the deposit of pigment in the minute vessels of the liver, especially after prolonged or repeated attacks of malarial fever; or it sometimes follows ulceration affecting the alimentary canal. The entire organ is wasted, but the condition differs from true cirrhosis in the absence of any granulations on the surface; in a section being dark-brown or bluish-red and homogeneous, there being little or no indication of lobules; and in the consistence being less firm. The hepatic cells are often diminished in size, and filled with brown pigment-granules. The ramifications of the portal vein are destroyed, its branches ending in cæcal club-shaped extremities.

SYMPTOMS.—In all the different forms of contracted liver just described, the chief diagnostic clinical indications are derived from the evidences of interference with the portal circulation; and from the signs afforded on *physical examination*. There are, however, additional symptoms resulting from derangement of the secreting functions of the liver; and others evidencing marked constitutional disturbance.

In the *early stage of true cirrhosis* it is customary to describe a train of symptoms which set in insidiously as a rule, but in reality they are merely those of congestion of the liver with gastro-enteric catarrh, such as a sense of discomfort or uneasiness; dyspeptic disturbances; an inclination to sickness or retching, &c. Though it might be suspected that cirrhosis was being set up, should such symptoms arise in association with abuse of alcohol, there is nothing characteristic about them. Occasionally the disease begins with severe local symptoms, indicating acute hepatic congestion, catarrh of the bile-ducts, and gastro-enteritis, accompanied with pyrexia. For a time there are *physical signs* of enlargement of the liver. As the case advances more or less of the consequences of *portal obstruction* are observed, viz., ascites, often extreme in amount; enlargement of the superficial veins of the upper part of the abdomen, especially on the right side; gastro-enteric congestion and catarrh; occasionally hæmorrhage from the stomach or intestines; hæmorrhoids; and enlargement of the spleen. Digestive disturbances are usually prominent, being due both to the state of the alimentary canal, and to deficiency or unhealthy quality of the bile. Although painful sensations over the hepatic region are sometimes present in the early stages, when the disease is advanced there is rarely

much uneasiness, if any; there may be local tenderness, which is chiefly due to peritonitis or peri-hepatitis. Jaundice also is but seldom a prominent symptom, being often entirely absent, but more or less yellow discoloration is observed in many cases from time to time, especially at the early period, mainly due to hepatic congestion, catarrh of the ducts, or pressure of enlarged glands in the portal fissure upon the main duct. Extreme jaundice occasionally results from peri-hepatitis; or it appears towards the termination of a case of cirrhosis, independently of any obstruction. The stools almost always contain bile.

Physical signs.—Those usually noticed are:—1. Diminution in area of hepatic dulness, in proportion to the degree of contraction. 2. Granulation or nodulation of the surface of the liver, with a feeling of hardness; in short, the tactile characters described under the morbid anatomy.— Sometimes the edge of the liver can be grasped between the thumb and fingers, and the changes thus readily realized. 3. Occasionally friction-sound. Ascites often obscures the examination, but under such circumstances the organ can frequently be easily felt after paracentesis. It must be remembered that in some instances the liver is not materially altered in dimensions, or that there may even be great enlargement of the organ, but the nodulated surface can then generally be readily recognized.

The *constitutional* symptoms are frequently very marked in advanced cases of cirrhosis, there being considerable emaciation and weakness; a peculiar sallow, earthy complexion; a dry harsh skin; and flabbiness of tissues. Purpuric spots and blotches on the skin are sometimes visible, and there may be extensive ecchymoses, or hæmorrhages from mucous surfaces may take place.

COURSE AND TERMINATIONS.—The *progress* of cirrhosis is generally very chronic, but it may run a tolerably rapid course from the first appearance of distinctive symptoms. Sometimes even after serious symptoms have appeared great improvement may take place, so that the patient may feel as if almost or quite restored to health, and may live for many years if he exercises proper care. In most cases, however, cirrhosis leads to a fatal issue. The chief *modes of death* are from gradual asthenia and exhaustion; jaundice with typhoid symptoms; lung-complications; acute peritonitis; or hæmorrhage from the alimentary canal. It must be remembered that the more serious of these events are liable to occur at any time.

The other forms of contracted liver only differ clinically from that just described in the circumstances under which they arise; and in the *physical characters* presented by the liver on palpation, if the organ can be felt. In the variety due to *peri-hepatitis*, considerable pain and tenderness are generally complained of from time to time.

VII. SYPHILITIC DISEASE.

The morbid conditions of the liver which may result from syphilis are:—1. *Albuminoid disease*. 2. *Peri-hepatitis* and its consequences. 3. *Simple interstitial hepatitis*, leading to general atrophy and indura-

tion. 4. *Gummatous hepatitis*, in which syphilitic gummata are formed more or less extensively, undergoing degenerative changes, and becoming surrounded by a dense fibroid tissue, from which processes extend towards the surface of the organ in various directions. The liver-tissue becomes destroyed, and deep cicatricial depressions or furrows are seen on the surface of the organ, giving rise to a lobulated appearance. During life the characters of the liver may often be determined by *physical examination*, in the gummatous form the organ being enlarged. Pain is frequently experienced, with tenderness; and sometimes signs of obstruction of the bile-ducts and portal vein appear. The progress is usually very chronic.

VIII. TUBERCULOSIS.

Tubercle is usually observed in the liver only in connection with general *acute miliary tuberculosis*. Occasionally it is secondary to chronic tubercular disease in other parts. It may break down and form small cavities. Clinically the disease cannot be recognized with any certainty. The liver is usually enlarged.

CHAPTER XXXI.

AFFECTIONS OF THE GALL-BLADDER.

THE morbid conditions to which the gall-bladder is liable need only be briefly indicated. Most of them cause enlargement of the organ, and it is important to be able to recognize the distinctive clinical characters of each form of enlargement.

1. *DISTENSION WITH BILE*.—When anything obstructs the common bile-duct, such as a gall-stone, the gall-bladder becomes filled with bile, and may attain enormous dimensions. There will then be the usual signs of obstructive jaundice, with enlargement of the liver; while the gall-bladder is perceptible as a fluctuating tumour, sometimes reaching nearly to the iliac crest, and being generally somewhat tender.

2. *ACUTE INFLAMMATION AND SUPPURATION*.—The mucous membrane of the gall-bladder is liable to simple catarrh, or to croupous or diphtheritic inflammation, like other mucous surfaces; but the most important form of *acute* inflammation is that which is attended with the formation of pus in its interior, which particularly results from irritation of its mucous membrane by gall-stones, or from obstruction of the cystic duct by these bodies. The condition is clinically indicated by a very painful and tender fluctuating enlargement of the gall-bladder, which may ultimately assume the characters of an abscess, or may even burst; accompanied with marked rigors and pyrexia, the latter tending to become of a hectic type. The inflammation is often preceded by signs of gall-stones; but there is neither jaundice nor hepatic enlargement as a rule.

3. CHRONIC INFLAMMATION. HYDROPS VESICÆ FELLÆÆ. DROPSY OF THE GALL-BLADDER.—If the cystic duct is obstructed for a long period, the gall-bladder may become gradually dilated, owing to the accumulation of a clear, serous or synovial-like fluid, the product of unhealthy secretion from the mucous surface, probably partly the result of chronic catarrh; while its walls become much thinned and atrophied. The organ is more or less distended, and often attains extreme size; but there is little or no pain or fever; while jaundice is absent; and the liver is not enlarged. Occasionally the course of events is different. The liquid portion of the contents of the gall-bladder becomes absorbed, leaving an inspissated substance, in which calcareous salts are deposited; the walls undergo thickening and contraction from chronic inflammation; and ultimately a firm puckered mass is left, enclosing a chalky pulp.

4. ACCUMULATION OF GALL-STONES.—Gall-stones are often present in the gall-bladder, without affording any clinical evidence of their existence. In some instances, however, and especially when they are very numerous and large, they cause local uneasy or painful sensations, which are increased after food, or after much exertion or jolting; as well as reflex disturbance of the stomach and other parts; and sometimes much constitutional discomfort and depression. Occasionally also they give rise to severe symptoms from time to time, by attempting to enter the cystic duct, and subsequently falling back into the gall-bladder. They may further excite inflammation or ulceration of the mucous surface, the latter ending sometimes in perforation, or giving rise to pyæmia. In rare instances such a number of calculi collect, that they form a tumour, even of considerable size, having the general characters of an enlarged gall-bladder as regards position, shape, and mobility, but presenting the following distinctive characters:—1. The tumour feels hard and sometimes nodulated. 2. On palpation a peculiar sensation is experienced, owing to the rubbing together of the calculi, compared to that produced by grasping nuts or pebbles. 3. A corresponding sound may be heard on auscultation; and occasionally loud rattling is perceptible on shaking or moving the patient. Now and then local peritonitis is excited by this enlargement, so that it becomes adherent and fixed. When such a tumour exists, there are necessarily more marked subjective sensations, such as weight and uneasiness, especially on moving from side to side. The progress of these cases, as well as the growth of the enlargement, is very slow and gradual.

5. CANCER.—The signs of this rare disease are:—1. Lancinating pains, with much tenderness, in the region of the gall-bladder. 2. A tumour, having more or less of the characters of enlarged gall-bladder, but usually feeling firm, resistant, irregular and nodulated, without the peculiar sensation of gall-stones; being adherent and fixed; and growing rapidly. There are always evidences of cancer in other parts; with well-marked cancerous cachexia. A fistulous communication with the intestines is often established. Gall-stones are usually present in the gall-bladder. Jaundice and vomiting are common symptoms.

portion of the pus may be absorbed, the contents becoming first caseous, then putty-like, and finally calcareous, the tissue around forming a dense cicatrix.

The gall-bladder is sometimes inflamed in cases of hepatic abscess. The bile contained in it is frequently unhealthy, but presents no special characters. The consequences of the rupture of an abscess into various structures are described in other parts of this work.

SYMPTOMS.—As a rule the symptoms of hepatic inflammation are very pronounced. They are both *local* and *general*.

Local.—Pain and tenderness are generally complained of over some part of the hepatic region, often preceded by mere uneasiness. The pain differs much in its severity and characters; in most cases it is at first dull, aching, and tense, but usually increases when suppuration sets in, and may then assume a throbbing character; it is more marked when the inflammation is near the surface. Sympathetic pains about the right shoulder and scapula are occasionally present, but, it is affirmed, only when the upper surface of the right lobe is affected. In this event also a deep breath or cough aggravates the pain; while the breathing is hurried, short, and chiefly upper costal, there being likewise some feeling of dyspnoea, with in many cases a short dry cough. Jaundice is very uncommon in connection with tropical abscess, but some degree of it is frequently observed in pyæmic cases. Ascites is extremely rare, unless the inflammation depends on pyle-phlebitis, when signs of great obstruction of the portal vein are prominent, and this is an important matter in diagnosis. More or less disturbance of the alimentary canal is almost always observed, such as loss of appetite, furred and irritable tongue, thirst, nausea or vomiting, constipation or diarrhoea. The urine is at first very markedly febrile; after suppuration has been established it often becomes pale, copious, and deficient in urea.

Physical characters.—The liver is at first uniformly and moderately enlarged. Should the abscesses formed be small and deeply seated, nothing further can be observed; but if one or more of them become large and superficial, the following characters are presented:—1. The general enlargement increases considerably, and in addition a *bulging prominence* presents in some direction, or occasionally more than one. This is generally observed in the epigastrium or right hypochondrium; sometimes it causes distension of the lower part of the chest, with flattening of the spaces. 2. The general surface and margins of the liver usually feel *smooth* and *regular*, but occasionally, from the projection of several small abscesses, or on account of peri-hepatitis, they are *undulated* and *irregular*. 3. The local bulging soon yields a sensation of *elasticity*, and afterwards of *fluctuation*, gradually extending and becoming more perceptible, surrounded often by a ring of inflammatory induration. No hydatid-fremitus can be felt. 4. The *hepatic dulness* is *altered in outline* as well as in *area*, and when the abscess tends towards the thorax, this is often one of the chief signs noticed. 5. *Auscultation* may reveal *friction-sound* over an abscess, due to peritonitis. It may also indicate encroachment upon the limits of the chest by the liver; and interference with the expansion of the right lung. 6. By means of the *aspirateur* pus may be obtained, and this is highly im-

portant as a means of diagnosis in doubtful cases. I may mention that marked *pulsation* may be observed in connection with an hepatic abscess presenting in the epigastrium, conducted from the aorta, and simulating an aneurism. The spleen may be enlarged, but this is chiefly observed in pyæmic cases, and is not usually the direct result of the hepatic disease.

General.—Chills or rigors often usher in an attack of acute hepatitis, followed by more or less pyrexia, with considerable constitutional disturbance. Suppuration is usually indicated by repeated rigors; fever of a hectic type, not uncommonly remittent or intermittent, attended with abundant sweats; and much prostration and wasting. Ultimately typhoid symptoms are very liable to arise, ending in low nervous disturbance and death. The constitutional symptoms are as a rule more severe in pyæmic than in tropical cases.

COURSE AND TERMINATIONS.—The ultimate course of events will depend upon the progress of the disease. The symptoms may subside, and the abscess undergo retrograde changes, ending in a cure. Almost always, however, it tends to open in one or other of the directions already mentioned, and the corresponding symptoms may be readily gathered from a little consideration. When it approaches the surface of the body, the abscess causes redness, œdema, and the other signs of superficial suppuration before it bursts or is opened. Most cases of hepatic abscess prove fatal and are rapid in their progress, but tropical cases may last for six months or more; the pyæmic form is much the more fatal and speedy in its termination. Some cases go on for a long period, and ultimately recover, the abscess discharging its contents and cicatrizing.

II. PERI-HEPATITIS.

This term is applied to inflammation of the *covering of the liver* and of *Glisson's capsule*, which is not uncommon as an acute affection, associated with peritonitis or organic diseases of the liver; or resulting from injury, or from extension of inflammation from neighbouring parts. It is also said to arise from a chill. It leads to exudation, with consequent thickening, opacity, and adhesions; while occasionally pus is formed.

SYMPTOMS.—The symptoms are pain over the liver, sometimes sharp, increased by cough and deep breathing; with superficial tenderness; but no particular derangement of the hepatic functions, or alterations in the physical characters of the liver. There is usually more or less pyrexia. If the affection is chronic, or if repeated attacks occur, as not uncommonly happens in connection with syphilis or chronic heart diseases, signs of obstruction of the portal vein or bile-duct, and of atrophy of the liver may be established.

III. INFLAMMATION OF THE BILE-DUCTS.

Catarrh of the bile-ducts is by no means an uncommon affection, being especially met with in children, and in old gouty persons. Its chief

causes are extension of catarrh from the duodenum; hepatic congestion; irritation of the mucous membrane by gall-stones, parasites, foreign bodies, and perhaps by unhealthy bile, which may cause considerable inflammation; and blood-poisoning in connection with fevers and other affections. The morbid appearances are similar to those of other forms of catarrh. Occasionally croupous or diphtheritic inflammation is observed in the bile ducts.

SYMPTOMS.—The symptoms of simple catarrh merely indicate more or less obstruction of the bile-duct, with consequent jaundice and enlargement of the liver and gall-bladder, this being generally preceded by signs of gastro-duodenal catarrh. There is often local pain and tenderness, with some degree of pyrexia. The duration and course of these cases vary, but generally they soon recover.

IV. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. DIAGNOSIS.—The occurrence of acute local symptoms connected with the liver, accompanied with constitutional disturbance, should lead to the suspicion of inflammation of this organ, especially in tropical climates, or if there is any obvious cause of pyæmia. At first there may be considerable difficulty in distinguishing inflammation from mere active congestion; and also in separating the different kinds of inflammation from each other, especially *suppurative hepatitis* and *perihepatitis*. When pus forms, this is generally revealed by evident *physical signs*; as well as by increased constitutional disturbance. Commonly, however, distinct objective indications of pyæmic abscesses are wanting. The differences between *pyæmic* and *tropical* abscess have already been alluded to. The chief conditions which may be mistaken for abscess in the liver are inflammation and suppuration of the gall-bladder; a suppurating hydatid-cyst; and abscess in the abdominal parietes. Local peritonitis may simulate hepatitis.

2. PROGNOSIS.—In the milder forms of hepatic inflammation the prognosis is generally favourable, but when suppuration occurs it is very serious. It will then depend mainly on the size and probable number of the abscesses; the direction in which they open, Maclean stating as his experience that the largest number of recoveries follows bursting into the lung, and then into the intestine, and that the prognosis is much more favourable when the abscess points at the ensiform cartilage than in an intercostal space; the general condition of the patient; and whether the liver-affection is or is not associated with some other morbid state, such as dysentery. *Pyæmic* abscesses are very fatal.

3. TREATMENT.—The slighter forms of hepatitis may be treated in the same manner as active congestion. Much difference of opinion is held as to the management of tropical abscess in its early stage. The usual measures recommended are venesection, or local bleeding by leeches or cupping; constant poulticing or fomentations; the use of *saline purgatives*; and the administration of calomel. Dr. Maclean, who strongly opposes bleeding and mercury, advocates the free employment of ipecacuanha, as in dysentery. Tartar emetic and tincture of

aconite have also been used. With regard to pyæmic abscess, there can be no question but that the severe lowering measures mentioned above are most injurious in this form of the disease. When suppuration occurs, poultices and fomentations must be assiduously applied. The question of *opening abscesses* connected with the liver is one which is also much discussed. Most authorities seem to be in favour of operating; some prefer leaving the abscess to take its own course, on account of the dangers of peritonitis, decomposition from entrance of air, hæmorrhage, or gangrene. If there is satisfactory evidence of the existence of a single abscess, it appears to me certainly advisable to evacuate the pus, and even in doubtful cases the aspirateur may be advantageously employed. When there are several collections of pus, as in pyæmia, operative interference is contra-indicated. The different modes of evacuation advocated are by means of the *aspirateur* or a *small trochar and canula*; by *free incision*; or by the application of *caustic potash* so as to produce a slough, this being also used to excite adhesions to the abdominal wall. The air should be as carefully excluded as possible, and carbolic acid freely used. In the ~~case~~ of a moderate-sized abscess, it seems best to let out all the pus at ~~once~~, and to leave a canula or drainage-tube in; when very large, it may be emptied gradually by successive operations. Large poultices should be afterwards applied, being very frequently changed, and *antiseptics* must be freely used, the patient lying as much as possible in that position most favourable for the escape of the pus. It is useful in some cases to wash out the abscess with weak carbolic acid. In the early period of the disease the diet should consist of milk, beef-tea, and such articles; when suppuration is set up it should be as nourishing as possible, while *stimulants* are called for at this time, as well as quinine, mineral acids, or tincture of steel. *Narcotics* are often required; and various symptoms demand attention in many cases. The general treatment applicable to pyæmia is indicated in pyæmic cases.

CHAPTER XXIX.

ACUTE YELLOW ATROPHY.

ÆTIOLOGY AND PATHOLOGY.—The causation of this rare hepatic disease is very uncertain. Most cases occur in connection with pregnancy, but the complaint has also been attributed to severe nervous disturbance from depressing emotions; to blood-poisoning in cases of typhus, scarlatina, and other fevers; to malarial influence; or to the production within the body of some special poison, the product of faulty digestion or assimilation. The chief *predisposing causes* mentioned are age, the disease being almost always observed before forty, but never in childhood; the female sex; intemperance; *venereal* excesses; and syphilis.

As regards its *pathology*, most authorities consider acute atrophy as

being the consequence of *diffuse parenchymatous inflammation of the liver*, excited by the action of some morbid poison. It has also been attributed to obstruction of the smaller bile-ducts; or to excessive formation of bile within them, whereby pressure is exercised on the surrounding structures.

ANATOMICAL CHARACTERS.—The obvious characters presented by the liver in acute atrophy are marked diminution in its size and weight; relaxation and softening of tissue; change in colour to a dull yellow; and disappearance of all traces of lobular divisions. The organ may be reduced to half its ordinary bulk or even less, being especially diminished in thickness, and it lies out of sight at the back of the abdomen, shrunken and flaccid, while the peritoneum covering it is lax, and is often thrown into folds. In parts where the disease is less advanced, hyperæmia and a greyish exudation have been described. Microscopic examination reveals fatty degeneration and destruction of the gland-cells, until ultimately nothing remains but a granular detritus, oil-globules, and pigment. There is only a little mucus in the gall-bladder and bile-ducts as a rule. Extravasations of blood in the alimentary canal and other parts, with ecchymoses, are not uncommon. The spleen is generally enlarged. The kidneys exhibit degeneration of, and deposits of pigment in, the epithelium-cells. Leucine and tyrosine are found in the blood; as well as in the tissues of the liver, spleen, and kidneys.

SYMPTOMS.—There may or may not be *premonitory* symptoms indicative of gastro-enteric catarrh, or general uneasiness and painful sensations may be experienced, but there is nothing characteristic about these phenomena. Slight jaundice is usually soon observed, and afterwards increases, but seldom becomes intense, and it may be limited to the upper part of the body. It has been attributed to blocking-up of the smaller ducts by the débris of the cells. Among the ordinary symptoms of acute atrophy are pain and tenderness over the epigastrium and right hypochondrium, vomiting, and constipation. There is not much pyrexia, but the pulse is often hurried and is liable to much variation, while the temperature is considerably raised in some cases towards the close.

The most striking clinical phenomena in this disease, however, are:—1. Those significant of the *typhoid state*, with prominent nervous symptoms. 2. Great diminution or complete disappearance of the hepatic dulness. 3. Generally enlargement of the spleen. 4. Peculiar changes in the urine. 5. Hæmorrhages into various parts. The nervous symptoms consist at first of headache, great depression, languor, irritability, and restlessness; speedily followed by low delirium, stupor, coma, twitchings, and convulsions, with involuntary discharge of fæces and urine. At the same time the tongue becomes brown and dry, with sordes on the teeth. The urine yields considerable quantities of leucine and tyrosine; while urea, uric acid, and salts are much diminished, being sometimes almost entirely absent; some bile-pigment is usually present, and often a little albumen or blood. Hæmorrhage most frequently takes place into the stomach and bowels; cutaneous petechiæ and vibices are not uncommon, and in rare instances uterine hæmorrhage or epistaxis occurs. The *course* of the disease is generally

very rapid ; and the *termination* almost invariably fatal. When acute atrophy arises in the course of pregnancy, it leads to miscarriage or abortion.

DIAGNOSIS.—At first it is difficult to diagnose acute atrophy of the liver, but once the symptoms are fully developed, and the physical signs indicative of diminution in the size of the organ become evident, the nature of the disease is plainly revealed.

PROGNOSIS is very grave, the disease almost always ending fatally.

TREATMENT.—Free purgation ; promotion of the action of the skin by hot air or vapour baths ; the administration of diuretics ; blistering and leeching the head ; and the use of cold douches have been the chief measures recommended in the treatment of acute atrophy of the liver, but they are of little service when the disease is established. Hæmorrhages and other symptoms must be treated as they arise.

CHAPTER XXX.

CHRONIC DISEASES OF THE LIVER.

I. HYPERTROPHY AND ATROPHY.

A SIMPLE *hypertrophy* of the hepatic tissue is said to be observed in some cases of leucocythæmia ; very rarely in diabetes ; and as the result of prolonged residence in hot climates. Clinically it is indicated by a slow, moderate, and uniform enlargement of the liver ; without any evident symptoms, either local or general.

On the other hand, *atrophy* generally occurs in old age ; or it may result from starvation ; or from pressure upon the surface of the organ by tight stays, peritoneal adhesions, and other conditions.

II. FATTY LIVER—HEPAR ADIPOSUM.

ÆTIOLOGY.—This affection belongs to the *fatty infiltrations*, the secretory cells of the liver becoming filled with oil. The conditions under which it is usually met with are :—1. In connection with phthisis and other *wasting diseases*, such as cancer, gastric ulcer, or chronic dysentery. 2. In *chronic lung and heart affections*, which lead to imperfect aëration of blood. 3. As the result of *over-feeding*, especially excessive consumption of hydro-carbonaceous substances ; and *abuse of alcohol*, particularly in the form of ardent spirits. Deficient exercise and indolent habits aid greatly in the development of the disease under these circumstances. Some individuals are much more predisposed to fatty liver than others. *Fatty degeneration* of the hepatic cells may be set up in connection with other morbid conditions of the liver, such as albuminoid disease or cirrhosis.

ANATOMICAL CHARACTERS.—In well-marked fatty liver the morbid

characters include enlargement and increase in weight, though the specific gravity is diminished, the margins of the organ being thickened and rounded, and the surface quite smooth; a more or less yellow colour, with opacity, both externally and on section, this being generally mottled with red; softening of the tissue, which has a doughy, inelastic feel, pits on pressure, and readily breaks down or tears; anæmia, but little blood escaping from the cut surface; loss of distinctness of outline of the lobules; and evidence of the presence of much fat, obtained either by the knife, by blotting-paper, or by ether. The liver may yield as much as from 43 to 45 per cent. of oily matters, which consist of olein and margarin, with traces of cholesterin. Microscopic examination shows enlargement of the cells, which also become spherical, and are more or less loaded with fat. In the less advanced cases the change is only revealed by the aid of the microscope. It is found that the morbid process extends from the circumference of the lobules towards their centre.

SYMPTOMS.—As a rule there are no evident symptoms connected with the liver in fatty disease. Dyspeptic disturbances are common. *Physical examination* is the only positive means of diagnosing fatty liver:—
 1. There is enlargement in a downward direction, slow in its progress, and usually moderate in degree, the organ never attaining any great size. 2. The shape is quite normal; and the surface and margins are smooth and regular, the latter feeling rounded. 3. Palpation often reveals a soft, doughy consistence of the tissue. The *general* symptoms are frequently those associated with fatty changes, namely, want of tone; inaptitude for exertion; pallor and pastiness of the skin. Signs of fatty changes in other organs and tissues, such as the heart, vessels, and kidneys, may be observed.

III. ALBUMINOID, LARDACEOUS, OR WAXY LIVER.

The *ætiology* and *pathology* of this morbid condition have already been considered (Vol. i., pages 74–77). The liver is one of the most common seats of albuminoid disease.

ANATOMICAL CHARACTERS.—Commonly the size and weight of the liver are considerably increased, as well as its specific gravity. The shape is scarcely altered, but the organ is somewhat flattened, with rounded edges. The surface and margins are quite smooth; the peritoneum is stretched; and the tissue feels very firm and resistant. On section the usual pale, anæmic, dry, greyish, and glistening aspect characteristic of lardaceous disease is observed; often the surface is quite homogeneous, without any trace of lobules, or these may appear to be enlarged. The ordinary chemical tests characteristic of the albuminoid material are yielded; and microscopic examination reveals its presence in connection with the vessels and cells. It is first observed in the middle zone of the lobules, where the branches of the hepatic artery are distributed. The exact appearances may be modified by the association of other morbid conditions with the albuminoid disease, such as fatty degeneration, cirrhosis, or syphilitic cicatrices. Commonly other organs are involved at the same time.

SYMPTOMS.—As a rule hepatic symptoms are not prominent. Local sensations rarely amount to more than a feeling of weight, tension, and discomfort. Jaundice and signs of obstruction of the portal circulation are also very uncommon, and when present are due either to pressure by enlarged glands in the portal fissure, or by thickenings in connection with local inflammatory changes; or ascites may result from chronic peritonitis, or from constitutional debility and anæmia. The *physical signs* of albuminoid disease are:—1. Enlargement, chiefly in a downward direction; gradual in its progress, the liver frequently attaining great dimensions at last, so that it presents a visible prominent tumour. 2. No perceptible alteration in form, the surface being smooth and uniform, with rounding of the margin. 3. Consistence dense and resistant, often extremely hard. There are the usual *general* symptoms indicative of albuminoid disease; with, in most cases, signs of implication of other organs; as well as of the existence of some constitutional condition, with which the disease is associated.

IV. HYDATID TUMOUR OF THE LIVER—ECHINOCOCCUS HOMINIS—ACEPHALOCYST.

ÆTIOLOGY AND PATHOLOGY.—The best illustration of the morbid conditions resulting from the development of the embryo of a tape-worm in the human body is afforded by the complaint now under consideration; and though the parasite may be met with in almost every organ and tissue in the body, yet the liver is by far its most frequent seat, so that the subject may be discussed once for all in the present chapter. A *hydatid tumour* is derived from the development of embryos of the *tænia echinococcus*, each of which produces a *scolex*, named *echinococcus hominis*; and these scolices become enclosed in cysts. This variety of tape-worm infests dogs and wolves, and it is supposed that fragments are evacuated in their excreta, the ova of which are subsequently set free, become mixed with water or food, and are thus introduced into the alimentary canal of a human being. When the embryos are liberated, they bore the walls of the stomach with their hooks, and then migrate, usually settling in the liver, and there developing into scolices. The *echinococcus* also infests sheep, and it is in consequence of eating their organs which are the seat of this parasite, that dogs become the subjects of tape-worm.

Iceland is the country in which hydatid disease is especially prevalent. In this part of the world it is only very exceptionally met with, and usually in persons who have been abroad. Most cases occur during middle life; and among the poorer classes.

ANATOMICAL CHARACTERS.—In the first place it will be well to describe the various structures which ordinarily enter into the formation of a typical *hydatid tumour*:—1. Externally there is a firm, whitish or yellowish, fibrous, vascular capsule, the result of proliferation of cellular tissue from irritation, which is adherent to the surrounding structures. 2. Within this, moulded as it were to its interior, but easily separated from it, is a delicate cyst or bladder, elastic, greyish, semi-transparent or gelatinous in aspect, and compared to boiled white of egg; under

the microscope this is seen to consist of several hyaline, concentric layers, a section presenting a characteristic laminated appearance. (Fig. 17.) The most internal layer is extremely delicate, and is studded with minute transparent cells. The term *mother-sac* or *vesicle* is usually applied to this structure as a whole; but it has also been limited to the internal lamina just mentioned, which has likewise been termed the *germinal membrane*. 3. A quantity of fluid is contained within this cyst, usually completely filling it, perfectly colourless, transparent, and watery as a rule, occasionally slightly opalescent; of low specific gravity—1007 to 1009; generally alkaline or neutral in reaction, but occasionally acid; and consisting mainly of a strong solution of chloride of sodium, without any albumin or other organic substance, but said to contain succinate of soda. 4. Floating in this fluid, or attached to the inner surface of the mother-cyst when small, are numerous *secondary* or *daughter-cysts*; in some instances these amount to hundreds or thousands, and completely fill the space, so that there is little or no fluid, and they become flattened by mutual pressure; each daughter-cyst has precisely the same structure as the mother-sac, and within the

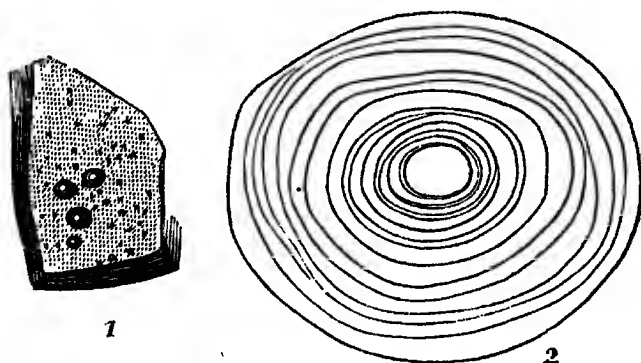


FIG. 17.*

larger of them there may be a third generation, and, rarely, a fourth is observed. 5. When the walls of the sacs are examined carefully, little whitish opaque spots are visible on the inner surface, which are the scolices of the *echinococcus* in various stages of development, usually arranged in groups or clusters, but occasionally single. These may also be free in the fluid, rendering it somewhat opaque. Each scolex is very minute, measuring from $\frac{1}{20}$ th to $\frac{1}{6}$ th of a line in length, but the length and form vary, according as the head is retracted into the body or extruded. (Fig. 18.) The head (Fig. 19) presents a proboscis, four suckers, with a double circle of characteristic curved hooks, which are movable and of unequal length (Fig. 20); a constriction separates it from the body, the latter being striated longitudinally and transversely, and presenting posteriorly a depression with a pedicle, by which the

* Fig. 17.—Hydatid found in man. 1. A fragment of the natural size; at its edge are shown the layers of which it is composed; on the external surface are several hydatid germs of different periods of development. 2. One of the germs flattened and magnified forty times, showing the stratified layers.

animal is fixed to the sac in its early condition. Numerous round and oval calcareous particles are imbedded in the tissue.

In most cases there is but a single tumour as above described, but sometimes two or more are found, though one generally predominates over the others. The size varies extremely, and a hydatid growth may attain such dimensions as completely to fill the abdomen, and even to encroach upon the chest. The daughter-cysts usually range from a millet-seed to an egg in size, but subsequent generations are very minute. Originally the shape tends to be spherical. The right lobe of the liver is the most frequent seat of hydatid tumour, but it may occupy any part of the organ, being either deep in its substance or superficial. If the hydatids are numerous, large, or superficial, they necessarily alter more or less the dimensions and form of the liver, giving rise to prominences. The surrounding hepatic tissue is often atrophied and compressed; sometimes the healthy portion becomes hypertrophied. Peritonitis may be excited over the tumour, giving rise to thickening and adhesions.

The events which are liable to happen in the course of hydatid disease are important, and may be summed up as follows:—1. The tumour enlarges, displacing adjoining structures and interfering with their functions, until it finally bursts in some direction, or is ruptured by violence or in some other way. The opening may take place externally through the abdominal or lower thoracic wall; into either pleura or lung, especially the right, which is the most common direction; the pericardium rarely; the peritoneum; the stomach or intestines; the gall-bladder or the bile-ducts; the hepatic vein or inferior vena cava. 2. Inflammation and suppuration sometimes occur, either spontaneously from rapid

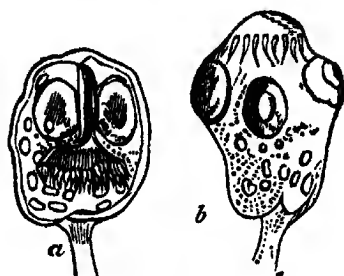


FIG. 18.*

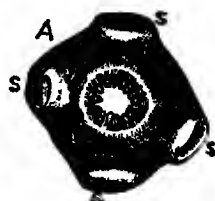


FIG. 19.†

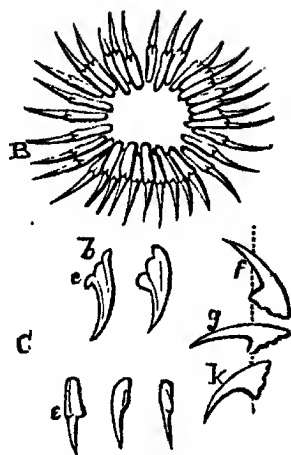


FIG. 20.‡

* Fig. 18.—Two *Echinococci* from a hydatid tumour. The one (a) has the head retracted within the vesicle; the other (b) has the head extruded.

† Fig. 19.—(A.) An *Echinococcus* viewed transversely, the head being directed towards the observer; s, s, suckorial discs.

‡ Fig. 20.—(B.) The circle of hooklets seen upon its under surface; thirty-four in number, seventeen long and seventeen short. (C.) b, c, Lateral views of the separate hooklets—b, the base; c, the central extremity or bifid process of the base; e, hooklets viewed upon the concave or inferior border; f, g, h, a diagram illustrating the movements and position of the hooklets.

growth ; from injury or operation ; or from the entrance of bile. 3. If the hydatid is slow in its progress, it not uncommonly undergoes degenerative processes as it advances in age, and these may ultimately bring about a spontaneous cure. The entrance of bile is supposed sometimes to induce this result. The outer capsule then becomes much thickened, firm, irregular, opaque, and ultimately calcified partially or completely. This impedes further growth, and the contained hydatids compress each other, shrivel and dry up, and finally die. The fluid also thickens and becomes opaque ; and, in short, fatty and calcareous degeneration takes place throughout, until there only remains a putty-like débris, in which shreds of the vesicles and hooklets of the echinococci are imbedded, revealing the nature of the mass. Hæmatoidine crystals are often found in it, as well as usually much cholesterin. A cicatrix-like depression may finally be left. 4. Occasionally cysts are found in which there are no echinococci. The name *acephalocyst* has been applied to this condition, and it has been regarded as an abortive or sterile form of the parasite, in which development is arrested ; or as an earlier stage of its growth.

Allusion may be briefly made here to a very rare form of this disease, named *multilocular hydatid-cyst*. The liver is found occupied by a mass, in some cases as large as a child's head or even larger, consisting of a stroma of cellular tissue, usually altered considerably by fatty degeneration, in which are imbedded cells or alveoli of various sizes, enclosing a gelatinous substance, in which microscopic examination reveals fragments of the laminated membrane of hydatids, hooklets, or occasionally even perfect scolices, as well as abundant calcareous particles. The centre of this mass is very liable to undergo suppuration, thus altering its characters considerably. This arrangement of the tumour has been attributed to the embryos having been deposited in the lymphatics, blood-vessels, or ducts of the liver ; or to the absence or early rupture of the external fibrous cyst, so that the parasites are able to grow and migrate in various directions, and may thus enter the different vessels.

Other organs and tissues are not uncommonly the seat of hydatid tumour along with the liver.

SYMPTOMS.—In general terms the ordinary clinical history of hydatid tumour of the liver may be summed up in the absence of morbid sensations referable to this organ ; of any interference with its functions ; or of constitutional disturbance : while the liver presents a peculiar form of enlargement. The disease may be latent from first to last. Should the growth attain a great size, a sense of local fulness and tension is often felt ; and in rare cases jaundice or signs of portal obstruction arise, in consequence of pressure upon the bile-ducts or portal vein, or because these vessels become blocked up by hydatids. Surrounding structures may also be interfered with, especially the diaphragm and respiratory organs. Should the cyst rupture, the consequent symptoms depend on the direction in which this takes place, being in many instances very grave. If the opening is external or into the lungs, characteristic structures may be discharged. The occurrence of suppuration is indicated by the ordinary local and constitutional signs of hepatic abscess.

The *physical signs* of hydatid tumour demand particular attention.

1. The liver is increased in size, and this is generally the first thing which attracts notice. The growth is as a rule very chronic and imperceptible in its progress, but finally the tumour may attain enormous dimensions, so as to give rise to a general enlargement of the abdomen, or it may encroach upon the chest, causing the right side to bulge.
2. The form of the liver is altered, as evidenced by palpation and percussion; while there is often an evident tumour in some part, especially the epigastrium or right hypochondrium. Smaller prominences are sometimes felt along the margins or surface of the organ, causing lobulation and irregularity.
3. Any prominent hydatid tumour generally feels quite smooth, and more or less elastic or fluctuating.
4. Hydatid-fremitus is often elicited very clearly.
5. In any doubtful case it is justifiable to make an exploratory puncture with the aspirateur, and thus to remove some of the fluid, the physical and chemical characters of which are quite characteristic. Perhaps some of the microscopic structures might come away at the same time.

It must be remarked that the signs above described are modified considerably by the degenerative and other changes which are liable to occur in a hydatid cyst. The outer wall may feel hard and bony. If a case only comes under observation when the abdomen presents a general enlargement, it is by no means easy in many instances, except by the history, to make out where the growth originated.

The *multilocular cyst* is said to be distinguished by being nodulated, hard, and tender; by jaundice, ascites, and enlargement of the spleen being usually present; and by the tendency in the tumour to inflame and suppurate. This variety may run a very rapid course.

V. CANCEROUS AND OTHER GROWTHS.

ÆTIOLOGY.—The liver is one of the most frequent seats of internal cancer, which may be either *primary* or *secondary*, the latter especially occurring after cancer of the stomach. The disease has sometimes been attributed to injury. Most cases are met with between 50 and 70 years of age, the affection being extremely rare before adult life. In some patients there is a hereditary taint. Dr. Walshe states that hepatic cancer is more common among males, and such has been my own experience.

ANATOMICAL CHARACTERS.—Ordinarily hepatic cancer assumes the form of distinct *nodules* or *tuberous masses*, having characters intermediate between those of scirrhus and encephaloid, approaching more towards one variety or the other in different instances. There is a wide difference as to size and number, the nodules being small at first, and gradually enlarging until they may ultimately reach the dimensions of a child's head, or even attain a larger size than this. Commonly several are found, unequal in size, and by their coalescence considerable tracts of the organ are sometimes involved. Originally the shape is spherical, but when the masses reach the surface they become flattened or even depressed in the centre, so as to present shallow concavities or *umbilications*. As a rule they are not separated from the

surrounding tissue by any definite structure, but occasionally a distinct cyst exists around a cancerous mass. Generally the consistence is moderately firm, but it may range from that of a soft, brain-like, semi-fluctuating substance, to that of a hard, cartilaginous tissue, and the amount of cancer-juice which can be expressed will vary accordingly. The colour of a section is in most cases white or yellowish-white, but more or less dotted and streaked with red, on account of the vessels present; it may, however, be extremely vascular and dark-red, resembling "fungus hæmatodes." The proportion of cancer-cells and fibrous stroma in any mass, as observed under the microscope, depends on the variety to which it belongs.

The liver is usually enlarged in proportion to the number and size of the growths, being often extremely large and heavy, as well as irregular in shape. Its tissues are more or less destroyed and compressed; the vessels and ducts are encroached upon or obliterated; and as a consequence jaundice and signs of obstructed circulation are often present. Sometimes thrombosis occurs in the portal branches or trunk. New vessels are developed, originating in the hepatic artery. Some observers describe the cancer as beginning in the centre of the lobules; others in the interlobular tissue. When a mass reaches the surface it excites localized peritonitis, with consequent thickening and adhesions. Neighbouring tissues may be involved by extension; and the lymphatic glands in the portal fissure are often implicated.

The growth of hepatic cancer is sometimes extremely rapid, especially when it is of the soft variety. Certain changes are liable to occur. The vessels of encephaloid cancer often give way, leading to extravasations of blood into its interior, which afterwards undergo changes, thus giving rise to unusual appearances. Very soft accumulations have been known to burst into the peritoneum in rare instances. Degenerative changes frequently arise in the less rapid forms, in the way of caseation; or of atrophy with contraction, induration, and the formation of a firm cicatrix. A section frequently presents a reticulated appearance, owing to fatty degeneration having taken place.

In exceptional cases hepatic cancer is *infiltrated*, and the organ may be smaller than usual, as well as diminished in weight. Melanosis, cystic cancer, and colloid have been extremely rarely met with in the liver. More recent and careful observation has shown that some of the morbid growths generally regarded as being of a cancerous nature, are composed of spindle-celled sarcoma. Cysts derived from obstructed bile-ducts, and erectile tumours have also been described in the liver.

SYMPTOMS.—Hepatic cancer is in the great majority of cases characterized by marked local disturbances, but the disease may be latent. At first merely a sense of discomfort and weight is experienced, soon, however, increasing to distinct pain and tenderness, which local sensations frequently become very severe, especially if the growth of the cancer is rapid, or if peritonitis is excited. The pain is often lancinating, shooting either towards the back or shoulders, or over the abdomen. Jaundice and ascites are also common symptoms, being usually the result of obstruction of the main ducts and vessels, in consequence of pressure exerted upon them by projections from the liver, or by glands in the portal fissure; ascites may also be associated with

chronic peritonitis. Once jaundice sets in, it is usually persistent, and often becomes intense, but it may be temporary from catarrh of the ducts. The spleen is but rarely enlarged. The superficial abdominal veins are sometimes distended.

The *physical characters* of the liver indicative of cancer are :—1. Enlargement, frequently very great, rapid in its progress, and chiefly increasing in a downward direction. 2. Alteration in shape and irregularity of outline, nodules or larger masses being felt, or sometimes even seen along the surface and margins, which nodules are not uncommonly umbilicated. 3. As a rule considerable firmness and resistance of the projections, though they occasionally have a soft elastic feel, or even yield a sensation of obscure fluctuation. 4. Occasionally friction-fremitus and sounds during breathing, these being chiefly due to peritonitis.

Digestive derangements are necessarily present in most cases, and they frequently first attract attention. The cancerous cachexia is usually well-marked, being accompanied with rapid wasting, debility, and anæmia. There may be pyrexia from time to time, which is sometimes considerable when the progress of the disease is rapid. Cancer is frequently present in other organs, either as a primary or secondary formation, especially in connection with the alimentary canal.

The *progress* of hepatic cancer is generally very rapid, and the disease is rarely prolonged beyond a year.

Other forms of tumour in the liver generally give rise to no definite symptoms, but they might possibly be detected on physical examination, or might give rise to local symptoms due to pressure.

VI. CIRRHOSIS OF THE LIVER—CHRONIC ATROPHY.

ÆTIOLOGY AND PATHOLOGY.—Undoubtedly several distinct morbid conditions of the liver have been included under the term *cirrhosis*, which have totally different modes of origin. With regard to the genuine disease, it is usually considered as resulting from a *chronic interstitial inflammation*, extending into the minutest portal canals, and leading to proliferation of cellular tissue between the lobules; or, as some pathologists describe, to the formation of an exudation, which undergoes organization and then contracts, with consequent pressure upon and obliteration of the vessels, and atrophy of the secreting elements. Some authorities have attributed cirrhosis to a *constitutional diathesis*, characterized by the formation of a fibroid tissue in different organs and structures of the body, of which the morbid change in the liver constitutes but a local development. While still others have regarded the disease as commencing in *degeneration and destruction of the secreting cells*, the ducts, vessels, and areolar tissue remaining, this process being followed or not by proliferation of the last-mentioned. The important *exciting cause* of cirrhosis is *abuse of alcohol*, and especially indulgence in ardent spirits on an empty stomach. Hence the common name—*gin-drinker's liver*. The alcohol being absorbed, and afterwards circulating through the liver, is considered either to set up inflammation, or to lead to degeneration of the cells, according to the view held as to the pathology of the disease. Cirrhosis, however, is certainly occasion-

ally met with where there is no history of intemperance, and it has then been attributed to the influence of malaria or prolonged heat; to the abuse of hot condiments and various articles of diet; to the circulation of products of faulty digestion; or to the extension of a localised peritoneal inflammation. Cases have come under my notice which could not be traced to any definite cause, and it has appeared to me that occasionally there may be some hereditary influence at work. The complaint is chiefly met with between 30 and 50 years of age, being rare in youth, and not common in advanced life. There is no doubt, however, but that cirrhosis of the liver may be met with even in young children, of which a striking example was brought before the Pathological Society by Dr. Griffiths of Swansea. Males suffer more than females; and also those persons who, from their occupation or in any other way, are more exposed to the ordinary exciting cause of the disease.

ANATOMICAL CHARACTERS.—In the advanced stage of cirrhosis the morbid appearances are very characteristic. The liver is greatly contracted, wasted, and diminished in weight, being sometimes reduced even to $\frac{2}{3}$ or $\frac{1}{2}$ the normal, especially the left lobe and edges, the latter being often merely a thin fibrous rim. The general form is frequently somewhat rounded. The surface is very pale, and is covered more or less with roundish prominences, varying in size from minute granules to projections or knobs measuring $\frac{1}{4}$ to $\frac{1}{2}$ an inch or even more in diameter, like hob-nails—hence the names *granular* or *hobnailed liver*. They may be tolerably uniform in size, but are more commonly unequal. Local puckerings or depressions are also often observed. The capsule is thickened, opaque, and inseparable; while local peritoneal adhesions and thickenings are almost constant. The consistence is remarkably dense, firm, tough, and leathery as a rule, which is best realized on making a section. This exhibits the same granular appearance as the surface, and sometimes in a much more marked degree. The colour is generally a mixture of dirty-white or greyish and yellow; the former being arranged in lines or bands of different widths, sometimes extending over considerable tracts; the latter, which varies in exact tint, being in some specimens bright-yellow, in others almost brownish, corresponding to the granulations. The name *cirrhosis* is derived from this yellow appearance. In extreme cases, however, but little of this colour is evident.

The intimate changes in structure, and the microscopic appearances must now be considered. The *white tissue* is generally supposed to be made up mainly either of fully-developed fibrous tissue; or of young connective-tissue elements in process of development, and chiefly resulting from proliferation. It has, however, been described as consisting in some instances of the remains of the vessels, ducts, and other tissues which have not undergone destruction. Generally this material presents numerous new vessels running through it, which are stated by Frerichs to be derived from the hepatic artery. The *yellow nodules* correspond to lobules or groups of lobules which have not yet undergone complete disintegration. The colour is chiefly due to stasis of bile, owing to pressure upon the minute ducts; it partly results, however, from fatty degeneration of the cells. A large proportion of these

cells have become wholly destroyed, and most of those which remain are greatly altered, appearing shrunken or fatty, or containing pigment-granules. The degeneration begins at the circumference of the lobules, and extends towards their interior. The *vessels* also present important changes. Many of the smaller branches of the portal vein are compressed or obliterated, and its capillaries are destroyed, so that injection of them from the main trunk is impossible. This trunk and the larger branches are often dilated, and may be occupied by thrombi. Sometimes a considerable branch of the vein is compressed. The hepatic artery is also commonly dilated, and new capillaries form in the fibrous tissue; frequently black pigment is found in its branches. The chief divisions of the hepatic vein are not altered, but many of its capillary tributaries are obliterated, and the communications between this vessel and the portal system are more or less destroyed. The remaining capillaries are commonly in a state of fatty degeneration.

The degree to which the changes just described are observed necessarily differs considerably according to the stage of the disease. In the earliest condition there can be no doubt but that the liver is enlarged, which is proved rather by clinical observation than by *post-mortem* examination. At this time the granular appearance is absent or but slightly marked; while the entire organ is congested, and is described as being occupied by a succulent, vascular, greyish material, consisting of young connective-tissue elements. In exceptional instances, however, a cirrhotic liver is enlarged throughout, and even to a marked degree, of which I have met with some striking examples. This is generally due to fatty or lardaceous disease being associated with the cirrhosis, but not always, there being in some cases merely a hypertrophic interstitial hepatitis.

The effects of cirrhosis outside the liver are highly important, and are visible on *post-mortem* examination, being mainly those already mentioned as resulting from obstruction of the portal circulation. Considerable anastomoses form between the hæmorrhoidal veins; and also between the superficial branches of the portal vein in the liver and the veins of the diaphragm and abdominal walls, through the peritoneal adhesions, and along the suspensory ligament.

Changes similar to those observed in cirrhosis of the liver are not infrequently met with in other organs and tissues at the same time.

A brief account will now be given of certain other forms of *chronic atrophy* of the liver:—

1. As the result of long-continued *mechanical congestion from heart disease*, the liver contracts and presents characters much resembling those of true cirrhosis, but there is an important difference, and the atrophy is rarely so marked as in the latter disease. It results from pressure of the distended tributaries of the hepatic vein upon the contiguous cells, causing their degeneration; hence the *centre* of the lobules becomes first wasted and depressed, while the circumference remains and forms granulations. Ultimately extensive depressions are produced, and more or less proliferation of connective-tissue occurs. Attacks of *chronic peri-hepatitis* are also common, which increase the tendency towards atrophy of the organ.

2. Dr. Murchison described a form of *granular atrophy*, generally independent of intemperance, in which the fibrous tissue is not increased, and the liver is softer than in health.

3. Atrophy may result from *adhesive pyle-phlebitis*, in consequence of which the trunk or some of the branches of the portal vein are obliterated. Cicatricial retractions are observed on the surface, with corresponding indurations.

4. Another form of atrophy of the liver is that due to chronic or repeated attacks of *peri-hepatitis*, which induces thickening of the capsule, or causes pressure upon the vessels, while fibrous bands pass into the interior, but there is no granular appearance.

5. Syphilis not uncommonly leads to atrophy of the liver, either by exciting *peri-hepatitis* or simple *interstitial hepatitis*; or as the result of changes in *gummatous deposits*.

6. The last variety is named *red atrophy* by Rokitansky, or *chronic atrophy* by Frerichs. It may be associated with the deposit of pigment in the minute vessels of the liver, especially after prolonged or repeated attacks of malarial fever; or it sometimes follows ulceration affecting the alimentary canal. The entire organ is wasted, but the condition differs from true cirrhosis in the absence of any granulations on the surface; in a section being dark-brown or bluish-red and homogeneous, there being little or no indication of lobules; and in the consistence being less firm. The hepatic cells are often diminished in size, and filled with brown pigment-granules. The ramifications of the portal vein are destroyed, its branches ending in cæcal club-shaped extremities.

SYMPTOMS.—In all the different forms of contracted liver just described, the chief diagnostic clinical indications are derived from the evidences of interference with the portal circulation; and from the signs afforded on *physical examination*. There are, however, additional symptoms resulting from derangement of the secreting functions of the liver; and others evidencing marked constitutional disturbance.

In the *early stage of true cirrhosis* it is customary to describe a train of symptoms which set in insidiously as a rule, but in reality they are merely those of congestion of the liver with gastro-enteric catarrh, such as a sense of discomfort or uneasiness; dyspeptic disturbances; an inclination to sickness or retching, &c. Though it might be suspected that cirrhosis was being set up, should such symptoms arise in association with abuse of alcohol, there is nothing characteristic about them. Occasionally the disease begins with severe local symptoms, indicating acute hepatic congestion, catarrh of the bile-ducts, and gastro-enteritis, accompanied with pyrexia. For a time there are *physical signs* of enlargement of the liver. As the case advances more or less of the consequences of *portal obstruction* are observed, viz., ascites, often extreme in amount; enlargement of the superficial veins of the upper part of the abdomen, especially on the right side; gastro-enteric congestion and catarrh; occasionally hæmorrhage from the stomach or intestines; hæmorrhoids; and enlargement of the spleen. Digestive disturbances are usually prominent, being due both to the state of the alimentary canal, and to deficiency or unhealthy quality of the bile. Although painful sensations over the hepatic region are sometimes present in the early stages, when the disease is advanced there is rarely

much uneasiness, if any; there may be local tenderness, which is chiefly due to peritonitis or peri-hepatitis. Jaundice also is but seldom a prominent symptom, being often entirely absent, but more or less yellow discoloration is observed in many cases from time to time, especially at the early period, mainly due to hepatic congestion, catarrh of the ducts, or pressure of enlarged glands in the portal fissure upon the main duct. Extreme jaundice occasionally results from peri-hepatitis; or it appears towards the termination of a case of cirrhosis, independently of any obstruction. The stools almost always contain bile.

Physical signs.—Those usually noticed are:—1. Diminution in area of hepatic dulness, in proportion to the degree of contraction. 2. Granulation or nodulation of the surface of the liver, with a feeling of hardness; in short, the tactile characters described under the morbid anatomy. Sometimes the edge of the liver can be grasped between the thumb and fingers, and the changes thus readily realized. 3. Occasionally friction-sound. Ascites often obscures the examination, but under such circumstances the organ can frequently be easily felt after paracentesis. It must be remembered that in some instances the liver is not materially altered in dimensions, or that there may even be great enlargement of the organ, but the nodulated surface can then generally be readily recognized.

The *constitutional* symptoms are frequently very marked in advanced cases of cirrhosis, there being considerable emaciation and weakness; a peculiar sallow, earthy complexion; a dry harsh skin; and flabbiness of tissues. Purpuric spots and blotches on the skin are sometimes visible, and there may be extensive ecchymoses, or hæmorrhages from mucous surfaces may take place.

COURSE AND TERMINATIONS.—The *progress* of cirrhosis is generally very chronic, but it may run a tolerably rapid course from the first appearance of distinctive symptoms. Sometimes even after serious symptoms have appeared great improvement may take place, so that the patient may feel as if almost or quite restored to health, and may live for many years if he exercises proper care. In most cases, however, cirrhosis leads to a fatal issue. The chief *modes of death* are from gradual asthenia and exhaustion; jaundice with typhoid symptoms; lung-complications; acute peritonitis; or hæmorrhage from the alimentary canal. It must be remembered that the more serious of these events are liable to occur at any time.

The other forms of contracted liver only differ clinically from that just described in the circumstances under which they arise; and in the *physical characters* presented by the liver on palpation, if the organ can be felt. In the variety due to *peri-hepatitis*, considerable pain and tenderness are generally complained of from time to time.

VII. SYPHILITIC DISEASE.

The morbid conditions of the liver which may result from syphilis are:—1. *Albuminoid disease*. 2. *Peri-hepatitis* and its consequences. 3. *Simple interstitial hepatitis*, leading to general atrophy and indura-

tion. 4. *Gummatous hepatitis*, in which syphilitic gummata are formed more or less extensively, undergoing degenerative changes, and becoming surrounded by a dense fibroid tissue, from which processes extend towards the surface of the organ in various directions. The liver-tissue becomes destroyed, and deep cicatricial depressions or furrows are seen on the surface of the organ, giving rise to a lobulated appearance. During life the characters of the liver may often be determined by *physical examination*, in the gummatous form the organ being enlarged. Pain is frequently experienced, with tenderness; and sometimes signs of obstruction of the bile-ducts and portal vein appear. The progress is usually very chronic.

VIII. TUBERCULOSIS.

Tubercle is usually observed in the liver only in connection with general *acute miliary tuberculosis*. Occasionally it is secondary to chronic tubercular disease in other parts. It may break down and form small cavities. Clinically the disease cannot be recognized with any certainty. The liver is usually enlarged.

CHAPTER XXXI.

AFFECTIONS OF THE GALL-BLADDER.

THE morbid conditions to which the gall-bladder is liable need only be briefly indicated. Most of them cause enlargement of the organ, and it is important to be able to recognize the distinctive clinical characters of each form of enlargement.

1. **DISTENSION WITH BILE.**—When anything obstructs the common bile-duct, such as a gall-stone, the gall-bladder becomes filled with bile, and may attain enormous dimensions. There will then be the usual signs of obstructive jaundice, with enlargement of the liver; while the gall-bladder is perceptible as a fluctuating tumour, sometimes reaching nearly to the iliac crest, and being generally somewhat tender.

2. **ACUTE INFLAMMATION AND SUPPURATION.**—The mucous membrane of the gall-bladder is liable to simple catarrh, or to croupous or diphtheritic inflammation, like other mucous surfaces; but the most important form of *acute* inflammation is that which is attended with the formation of pus in its interior, which particularly results from irritation of its mucous membrane by gall-stones, or from obstruction of the cystic duct by these bodies. The condition is clinically indicated by a very painful and tender fluctuating enlargement of the gall-bladder, which may ultimately assume the characters of an abscess, or may even burst; accompanied with marked rigors and pyrexia, the latter tending to become of a hectic type. The inflammation is often preceded by signs of gall-stones; but there is neither jaundice nor hepatic enlargement as a rule.

3. CHRONIC INFLAMMATION. HYDROPS VESICÆ FELLÆÆ. DROPSY OF THE GALL-BLADDER.—If the cystic duct is obstructed for a long period, the gall-bladder may become gradually dilated, owing to the accumulation of a clear, serous or synovial-like fluid, the product of unhealthy secretion from the mucous surface, probably partly the result of chronic catarrh; while its walls become much thinned and atrophied. The organ is more or less distended, and often attains extreme size; but there is little or no pain or fever; while jaundice is absent; and the liver is not enlarged. Occasionally the course of events is different. The liquid portion of the contents of the gall-bladder becomes absorbed, leaving an inspissated substance, in which calcareous salts are deposited; the walls undergo thickening and contraction from chronic inflammation; and ultimately a firm puckered mass is left, enclosing a chalky pulp.

4. ACCUMULATION OF GALL-STONES.—Gall-stones are often present in the gall-bladder, without affording any clinical evidence of their existence. In some instances, however, and especially when they are very numerous and large, they cause local uneasy or painful sensations, which are increased after food, or after much exertion or jolting; as well as reflex disturbance of the stomach and other parts; and sometimes much constitutional discomfort and depression. Occasionally also they give rise to severe symptoms from time to time, by attempting to enter the cystic duct, and subsequently falling back into the gall-bladder. They may further excite inflammation or ulceration of the mucous surface, the latter ending sometimes in perforation, or giving rise to pyæmia. In rare instances such a number of calculi collect, that they form a tumour, even of considerable size, having the general characters of an enlarged gall-bladder as regards position, shape, and mobility, but presenting the following distinctive characters:—1. The tumour feels hard and sometimes nodulated. 2. On palpation a peculiar sensation is experienced, owing to the rubbing together of the calculi, compared to that produced by grasping nuts or pebbles. 3. A corresponding sound may be heard on auscultation; and occasionally loud rattling is perceptible on shaking or moving the patient. Now and then local peritonitis is excited by this enlargement, so that it becomes adherent and fixed. When such a tumour exists, there are necessarily more marked subjective sensations, such as weight and uneasiness, especially on moving from side to side. The progress of these cases, as well as the growth of the enlargement, is very slow and gradual.

5. CANCER.—The signs of this rare disease are:—1. Lancinating pains, with much tenderness, in the region of the gall-bladder. 2. A tumour, having more or less of the characters of enlarged gall-bladder, but usually feeling firm, resistant, irregular and nodulated, without the peculiar sensation of gall-stones; being adherent and fixed; and growing rapidly. There are always evidences of cancer in other parts; with well-marked cancerous cachexia. A fistulous communication with the intestines is often established. Gall-stones are usually present in the gall-bladder. Jaundice and vomiting are common symptoms.

CHAPTER XXXII.

GALL-STONES—BILIARY CALCULI—CHOLELITHIASIS.

ÆTIOLOGY AND PATHOLOGY.—There is considerable uncertainty as to the mode of origin of gall-stones. The chief views may be thus stated :—1. That they are merely the result of *inspissation* and *concentration of bile*. 2. That they depend upon certain *biliary ingredients being in excess*, especially cholesterin and colouring matters. 3. That the bile has some *abnormal chemical composition*, either when first formed, or as the consequence of subsequent changes, which prevents it from holding certain elements in solution, and hence they are deposited. Thus calculi have been attributed to deficiency of soda, with excessive acidity of the bile ; excess of lime, causing a separation of pigments ; decomposition of the salts of soda with the biliary acids ; or decomposition of the biliary acids themselves, with consequent precipitation of cholesterin and pigment. 4. That they originate in *plugs of mucus, epithelium, or foreign bodies*, upon which the ingredients of the bile are afterwards deposited as a nucleus. It is highly probable that each of these views is correct in different cases, and when once the formation of a gall-stone has commenced, its increase may be due to some other cause than that which originated it in the first instance. There can be no doubt but that a catarrhal state of the gall-bladder and ducts favours the production of calculi, either by inducing stagnation of bile ; or, as some believe, by the mucus then formed favouring decomposition of this secretion, or impregnating it with carbonate of lime. This decomposition has also been attributed by Thudichum to the absorption of some ferment from the intestines.

There are some important *predisposing causes* of gall-stones, viz., advanced age ; the female sex ; sedentary habits ; habitual constipation ; over-indulgence in animal food and in stimulants ; and organic diseases of the liver, gall-bladder, or bile-ducts, interfering with the escape of bile. Biliary calculi have also been attributed to drinking water containing excess of lime, but on no adequate grounds.

ANATOMICAL CHARACTERS.—By far the most frequent *original seat* of biliary calculi is the *gall-bladder*, but they may also be found in any portion of the bile-ducts, or even in the liver itself. The number varies from one to hundreds or thousands ; usually several are found. There is also a wide range as to size, this being in an inverse ratio to the number ; several are sometimes cemented together, so as to form a large concretion. Originally most of the calculi are round or oval, but when numerous, owing to mutual friction they become worn and angular, presenting flat or concave facets, or occasionally actual articulations. When formed in the ducts they exhibit curious shapes, being branched or coral-like. As a rule gall-stones have a brownish or greenish-yellow colour, and are opaque, but they present an endless variety of tints, ranging from white to black, blue, green, red, and other colours, accord-

ing to their composition; occasionally they are somewhat translucent. They frequently have a greasy or saponaceous feel, with a waxy, brittle consistence, being readily cut or crushed; sometimes they are very firm. Most of them sink in water when recent, but some float, and most gall-stones will do so after having been dried. The structure is rarely homogeneous and uniform. In the majority of cases, after a calculus has existed for some time, a section reveals distinctly three parts, named from within out—the *nucleus*, of which there may be more than one; the *body*, which is often made up of concentric layers, or presents a radiated appearance; and the *cortex* or *crust*, this being usually smooth externally, but occasionally wrinkled, rough, or even tuberculated and warty. As a rule the layers become lighter in colour from the centre towards the circumference, but not always. Sometimes a fractured calculus presents a crystalline aspect. The *chemical composition* is very variable, but the most common ingredients are cholesterol and bile-pigments, with a little lime or magnesia. To these may be added biliary and fatty acids, generally combined with lime; modified bile-pigments; phosphates; carbonates; salts of soda or potash in small proportions; and metals (iron, copper, and manganese). The nucleus is often made up of mucus and epithelium, and the former material may also unite the different parts. The appearances differ according to the composition, which is not necessarily uniform even in the same layer. It is quite impossible to describe the characters corresponding to the various ingredients, but it may be stated generally that in proportion to the amount of cholesterol which a calculus contains is it whiter, more transparent, crystalline or radiated and lamellar, and of lighter specific gravity.

Biliary sand or gravel is not uncommonly met with, consisting either of cholesterol, bile-pigment, or black pigmentary matter.

The morbid conditions which are liable to be set up by gall-stones may be stated as follows:—1. Irritation, inflammation, suppuration, or ulceration, with consequent pyæmia or perforation, affecting either the gall-bladder or ducts, perforation taking place in different directions, but especially into the stomach, duodenum, or peritoneum, or externally through the abdominal wall; rarely into the colon, portal vein, pleura, pelvis of the right kidney, or vagina. Permanent fistulæ may be left. 2. Inflammation and abscesses in the liver, if lodged there; or the formation of a cyst around the calculi. 3. Obstruction of some of the ducts in the liver, or of the hepatic, cystic, or common bile-duct, with the usual consequences. 4. Obstruction of the intestines by a large calculus, this having probably entered through a fistulous communication from the gall-bladder. 5. Inflammation, ulceration, or gangrene of the bowel, with consequent perforation.

SYMPTOMS.—It is only needful here to describe those symptoms which indicate the passage of a gall-stone along the duct to the intestine—*biliary* or *hepatic colic*—these being usually severe, but not always. An attack of hepatic colic begins with a sudden intense pain in the right hypochondrium, in some cases most excruciating, often coming on just after a meal or after effort; it is described as constricting, gripping, tearing, burning, or boring, and shoots over the abdomen, round the side to the back, or towards the right shoulder. The

patient is doubled up and rolls about just like in ordinary colic, groaning or screaming, and pressing upon the abdomen, which gives some relief, there being generally no tenderness at first. The pain may subside, leaving a dull aching, but urgent paroxysms recur at intervals. The attacks are accompanied with much exhaustion; signs of collapse; a distressed and anxious expression of countenance; faintness, which may end in actual syncope; and cramps of the abdominal muscles. There is no pyrexia. Sympathetic vomiting is frequently present, and sometimes hiccup is a distressing symptom. Among occasional symptoms are observed spasmodic tremors or actual convulsions, and marked rigors. In the course of a day or two, should the gall-stone reach the common duct, as a rule the usual signs of obstructive jaundice are developed, which may become intense, the duration of the jaundice depending upon that of the obstruction. When the calculus reaches the duodenum the suffering generally subsides suddenly, with a feeling of intense relief, and then the jaundice gradually disappears. In the great majority of cases biliary calculi pass on by the bowels, and are discharged in the fæces, sometimes in great numbers, without producing any further mischief, and they may be detected by washing the stools through a sieve or through muslin. Very rarely they pass into the stomach and are vomited.

There are a few points of practical import which require notice. The intensity of the pain is by no means necessarily in proportion to the size of a gall-stone, but rather depends upon its angular shape. It usually diminishes when the concretion reaches the common duct, because this is larger than the cystic duct, but it increases again as the orifice into the duodenum is approached. Jaundice is not a necessary accompaniment, or it may be but slight, because when the calculus is angular in form it leaves room for the bile to flow by, or its passage is sometimes too rapid to allow of the appearance of jaundice; on the other hand this may become persistent and extreme, owing to the permanent impaction of a gall-stone. It is very important to look for the calculi in the stools, as by their shape, number, and size an opinion can often be arrived at as to whether any remain behind in the gall-bladder, while at the same time their characters are recognized. After one large gall-stone has escaped, other smaller ones often follow without causing any particular disturbance. Sometimes the pain subsides, but no calculus is passed, because it returns to the gall-bladder. Pain and soreness may remain after the escape of a concretion into the duodenum, owing to nervous irritability on the part of the patient, or to local irritation of the nerves; or inflammation may be excited, indicated by pain and tenderness, with fever. The symptoms of hepatic colic are occasionally merely due to the passage of grit or inspissated bile. An attack may end fatally, from the mere intensity of the pain and collapse, quite irrespective of the serious morbid changes which a gall-stone is liable to set up, any one of which may cause death.

CHAPTER XXXIII.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT
OF CHRONIC HEPATIC AFFECTIONS.

I. DIAGNOSIS.

THE main elements which assist in the diagnosis of chronic hepatic diseases, both from other affections and from each other, are as follows:—1. The *general history* of the patient may reveal some known cause of certain liver-complaints, especially abuse of alcohol; over-eating, with deficient exercise and general luxurious habits; prolonged residence in tropical climates or in malarial districts; the previous occurrence of dysentery or ague; or syphilitic infection. *Family history* may afford some aid in diagnosis, especially if indicating a cancerous taint; while in some cases the *age* and *sex* of the patient also deserve consideration. 2. The *constitutional condition* is highly important. Thus there may be some disease with which lardaceous or fatty liver is likely to be associated; or signs of the cancerous cachexia, of syphilis, or of cirrhosis may be evident. On the other hand, the absence of any constitutional disturbance is sometimes serviceable in diagnosis. 3. The presence or absence of *symptoms referable to the liver*, as well as their nature, intensity, and the history of their progress, deserve careful attention, especially as regards pain and tenderness; jaundice; and ascites or other evidences of portal obstruction. 4. *Physical examination* is of course of essential value. This will be presently more fully alluded to. 5. The *state of other organs* may afford much aid in diagnosis, especially by revealing local manifestations of some constitutional disease, e.g., cancer in the stomach, or waxy kidney; or of some morbid condition with which hepatic derangement is likely to be associated, especially ulceration in the alimentary canal, gastro-enteric catarrh, or disease of the heart obstructing the circulation. 6. The *rapidity of the progress* of a case up to the time when it is first seen; its subsequent *course*; and the results of *treatment*, are to be taken into account in doubtful cases.

Physical examination demands special attention, particularly in detecting and making out the characters of enlargements or contractions of the liver; and of enlargements of the gall-bladder. For differential diagnosis* of *hepatic enlargements* the following points must be noted, and in the description of each individual disease an endeavour has been made to arrange the characters in the same order:—*a.* The extent, direction, and rapidity of growth. *b.* Whether the liver is normal in shape and outline; or if it presents outgrowths or irregularities. *c.* The conditions of the surface and margins, as to smoothness, nodulation, &c. *d.* The degree of resistance and other sensations afforded by the liver generally, as well as by any special prominences, including fluctuation and hydatid-fremitus. *e.* Whether there is any

evidence of local peritonitis, indicated by friction-fremitus or sound, or by adhesions of the liver with the abdominal wall. *f.* Now and then it is requisite to use the aspirateur. The characters to be observed in connection with *contractions* of the liver, and abnormal conditions of the *gall-bladder*, have been sufficiently indicated in their respective descriptions. It is only necessary to add with regard to the *gall-bladder*, that it should always be noticed whether this is altered alone or along with the liver, and *vice versâ*.

It may be useful to enumerate here the causes of *enlarged liver*. The ordinary forms are due to:—1. Congestion, especially mechanical. 2. Accumulation of bile from any obstruction in the ducts. 3. Albuminoid disease. 4. Fatty infiltration. 5. Hydatid disease. 6. Cancerous and other growths. 7. Acute hepatitis, especially when ending in suppuration. 8. Cirrhosis in its early stage; and in very exceptional instances even when advanced. As very rare causes may be mentioned—9. Simple hypertrophy. 10. Syphilitic gummosis hepatitis. 11. Tubercle. 12. Lymphatic growths. 13. A peculiar enlargement associated with vitiligoidea.

The chief practical difficulties in making out a diagnosis which have come under my notice are as follows:—1. Hepatic enlargement, and sometimes even changes in shape and other characters of the liver, may be simulated by the normally large size of the organ in children; congenital malformation; pressure by a rickety or otherwise deformed thorax, or as the result of tight-lacing; depression by various morbid conditions within the chest, especially pleuritic effusions and tumours; or elevation towards the chest by abnormal conditions within the abdomen. On the other hand, abnormal conditions of the liver may be obscured by distension of the colon with gas, which may even give rise to signs simulating atrophy of the organ. 2. Morbid states of other structures often give rise to signs of hepatic derangement; or, on the contrary, they may put these in the background. Thus, enlargement of the liver may be simulated by a rigid and contracted state of the right rectus abdominis muscle; inflammation and suppuration in the abdominal walls; accumulation of feces in the colon; or by a tumour in connection with the right kidney, supra-renal capsule, or peritoneum, especially the great omentum. Again, a neighbouring disease, particularly scirrhus of the head of the pancreas, often interferes with the escape of bile from the liver, and thus leads to its enlargement, accompanied with jaundice. The co-existence of ascites, or of chronic peritonitis with effusion, frequently renders physical examination unsatisfactory. The use of the aspirateur is then most serviceable, in order to remove the fluid; and also the plan of making sudden pressure over the liver. Not uncommonly disease of the liver is obscured by symptoms referable to a morbid state of some other organ, *e.g.*, cancer of the stomach; and it often itself gives rise to serious disturbance of the alimentary canal. Occasionally the liver is affected along with other organs and structures in the abdomen, particularly in cases of cancer, and then it is frequently impossible to make out distinctly what parts are actually involved. 3. Sometimes the liver becomes so enormous, especially as the result of hydatid disease, that it fills the abdomen, and hence it becomes impossible to determine exactly where the enlargement commenced. In

such cases the history of its growth, as regards the region from which it started ; and perhaps the greater prominence of the enlargement over the hepatic region, may clear up the difficulty. 4. In some instances the liver is the seat of two or more distinct morbid conditions, the signs being modified accordingly, such as cirrhosis with fatty or albuminoid disease. 5. With regard to individual diseases, it may be mentioned that *hydatid tumour* is liable to be confounded with distended gall-bladder ; soft cancer ; right pleuritic effusion ; hepatic abscess which has become somewhat chronic ; aneurism ; cystic disease of the kidney ; or hydatids outside the liver. *Cancer* may be simulated by syphilitic disease ; waxy liver, especially if combined with cirrhosis, or if some parts of the liver are more affected than others, so as to give rise to local projections ; other forms of cirrhosis attended with enlargement ; or multilocular hydatid disease.

It is requisite to make a few remarks relative to *pain* referred to the hepatic organs. This may be simulated by painful affections of the superficial structures, either muscular or neuralgic ; gastric and duodenal disorders, either functional or organic ; intestinal colic ; accumulation of feces in the colon ; aneurismal, pancreatic, and other tumours pressing on the nerves ; the passage of a renal calculus ; pleurisy ; the pain met with in hypochondriasis ; or local peritonitis. The attacks due to the passage of a *gall-stone* are generally clearly indicated by the individuals in whom they occur ; the past history ; and the symptoms present, especially when these are followed by jaundice, and by the escape of calculi in the stools. It must be borne in mind that gall-stones are not uncommonly associated with organic disease of the liver or gall-bladder. Simple *hepatalgia* is difficult to make out positively. Its characters have already been sufficiently indicated.

II. PROGNOSIS.

The prognosis in the case of a chronic hepatic disease depends mainly upon the nature of the complaint ; the degree to which the functions of the liver are interfered with, the escape of its secretion prevented, or its circulation impeded ; the constitutional condition ; the state of other organs ; the possibility of removing any causes which may be keeping up the disease ; and the results of treatment. *Fatty* and *lardaceous disease* are very slow in their progress, and in many cases do not seem to hasten the fatal issue materially, though they are but little amenable to treatment. *Cancer* is necessarily fatal, and is frequently very rapid in its course, especially when of the softer kind. *Hydatid disease* is markedly chronic, and usually unattended with danger ; while it may be cured in many cases by appropriate treatment. It occasionally proves dangerous in consequence of the cyst rupturing, or becoming inflamed and suppurating ; or through some of its contents being discharged into the bile-ducts, blocking them up. *Syphilitic liver* can frequently be much improved by early and proper treatment. The different forms of *contracted liver* are generally serious as regards their ultimate prognosis, though usually slow in their progress. I desire, however, again to draw attention to the fact, that in cases of cirrhosis,

if the ascites can be permanently got rid of, a result which may not uncommonly be attained, the patient may be restored to comparatively good health, and may live for many years, engaging in the ordinary avocations of daily life, even in cases which appear to be almost hopeless. It must be remembered that serious and sometimes rapidly-fatal hæmorrhage from the alimentary canal is liable to occur in cirrhosis. From the account given of the clinical history of *gall-stones*, it will be evident that there are many dangers attending them. Examination of any calculi passed, as to size, number, and shape, will aid in determining whether any remain in the gall-bladder; and whether the attacks of hepatic colic are likely to recur.

III. TREATMENT.

The management of cases of chronic hepatic disease should be conducted according to very simple and obvious principles.

1. The **diet** needs careful supervision. It often has to be adapted to some constitutional condition, and therefore of a nutritious character, containing abundant protein elements; but it should always be as simple and easily digestible as possible, and particular caution is requisite in the use of alcohol, of hot condiments, of fatty, amylaceous, and saccharine substances, and of rich articles of diet generally. In many cases it is highly important to forbid all stimulants, or only to allow light wines, and if spirits are ever needed, they should be given much diluted, and in restricted quantities. Any one who is accustomed to indulge in excess of alcohol, and particularly in ardent spirits, must be impressed with the absolute necessity of relinquishing this habit. It is desirable to recommend the patient to take an abundance of salt with food.

2. **Hygienic management** is of much consequence in some cases. In addition to the ordinary measures for improving the general health, the points which claim special notice are removal from a tropical climate, or from a malarial district; cessation of sedentary and luxurious habits generally, a sufficient amount of exercise in the open air being taken daily; and the maintenance of free excretion of the skin, by the aid of baths.

3. Treatment directed against some **constitutional condition** often proves highly serviceable, and it may have a direct effect upon the liver, which applies particularly to *fatty*, *lardaceous*, and *syphilitic* disease. General *tonic* treatment, as well as remedies for improving the quality of the blood, are beneficial in many cases, such as the various preparations of iron, strychnine or nux vomica, or mineral acids with bitters. Tincture of iodine well-diluted; iodide of potassium or of iron; and carbonate of ammonia or chloride of ammonium, have been found by different observers to influence the size of albuminoid liver. Chloride of ammonium has been much recommended in various forms of chronic hepatic disease. Of course mercury and iodide of potassium are the remedies for syphilitic disease.

4. There is a class of remedies which act more or less directly upon the liver, influencing its secretory functions, and hence named **chol-**

gogues. Our knowledge respecting these agents has been until comparatively recently vague and uncertain, but the admirable experiments which have been conducted under the direction of Prof. Rutherford, of Edinburgh University, have cleared away much of what was mere traditional belief, and have given us definite and reliable information on this subject. The term *cholagogue* is applied to any drug which increases the flow of bile, and Rutherford divides the agents belonging to this general group into (a) *hepatic stimulants*, or those which influence the bile-secreting mechanism; and (b) *bile-expellents*, which increase the expulsion of bile, by stimulating muscular contraction of the gall-bladder and bile-ducts. He found that there is no relation between the action of medicines as intestinal stimulants and hepatic stimulants, many agents which exert a powerful effect upon the intestines having no influence upon the liver, and *vice versa*. The chief medicines which have usually been credited with a special action upon the liver are mercurial preparations, especially blue-pill, calomel, and grey powder; podophyllum and podophyllin; nitro-muriatic acid; and taraxacum. Rutherford's experiments have proved that calomel has no influence as a bile-secreting agent, and taraxacum has only a very feeble action of this kind. With regard to recognized drugs, he found the following to be more or less powerful hepatic stimulants, namely, podophyllin, provided the dose is not too large; aloes, jalap, and colocynth; dilute nitro-muriatic acid; corrosive sublimate, either alone or combined with calomel; sulphate, phosphate, benzoate, and salicylate of sodium; sulphate of potassium; phosphate and benzoate of ammonia; and ipecacuanha. Rhubarb is a certain, though not a powerful, hepatic stimulant. In addition to these recognized medicines, Rutherford has experimented upon others, and has discovered several agents which seem to have an important influence upon the hepatic secretion, but it will only be practicable to enumerate the most prominent, which include substances named euonymin, sanguinarin, baptisin, hydrastin, juglandin, inulin, and iridin.

The experiments just alluded to refer to the action of medicines upon the liver in health. These must not be relied upon too implicitly in the treatment of diseased conditions, for clinical observation affords evidence that in certain morbid states, when the bile is deficient, mercurial preparations decidedly increase the quantity of this secretion. It is probable that they act by aiding in the removal of some impediment to the formation of bile; or by promoting its discharge. Murchison remarks respecting these agents, that they probably irritate the upper part of the small intestines, so that the bile is propelled onwards, instead of being reabsorbed. The best plan of administering mercury, in the case of an adult, is to give occasionally a tolerably full dose of calomel or blue-pill, either alone or combined with rhubarb or colocynth pill and extract of henbane. For children grey powder answers best. It is certainly injurious to fall into the habit of constantly taking these medicines. A dose of podophyllin now and then is frequently very serviceable. A combination of nitro-muriatic acid with extract of taraxacum enjoys considerable repute, especially in the treatment of congestion of the liver, and of the earlier stages of cirrhosis, but probably the latter acts mainly through its direct action upon the ali-

mentary mucous membrane. Sir Ranald Martin recommended the nitro-muriatic acid bath (3i of strong nitric, and 3ii of hydrochloric acid to a gallon of water, at 90° to 98° F.), in which the feet are placed, and then the inside of the upper and lower extremities, as well as the abdomen, are sponged over freely. This bath seems to be of much benefit to those who come from tropical climates, suffering from disordered liver. Rutherford has found euonymin and iridin very efficient remedies in the treatment of "biliousness" and functional hepatic derangement. He gives of the former gr. ij, of the latter gr. iv, at night, in the form of a pill, followed in the morning by a mild saline aperient.

5. Symptoms referable to the **alimentary canal** commonly call for treatment in connection with liver-diseases, such as those due to gastric or enteric catarrh, constipation, flatulence, or hæmorrhage; or there may be co-existing organic disease affecting the stomach or intestines, such as cancer. These conditions must be treated by the usual remedies, especially by alkalies and their carbonates, citrates, tartrates, and other vegetable salts; different bitter infusions or tinctures; saline aperients; and saline mineral waters, either English or Continental. It is very desirable to keep the bowels acting as regularly as possible, though the frequent use of strong purgatives must be avoided. Should the patient be suffering from hæmorrhoids, confection of senna or of sulphur are valuable aperients.

6. The two prominent symptoms so frequently calling for treatment in liver-affections, namely, **jaundice** and **ascites**, have already been fully considered. I cannot, however, refrain from again insisting upon the importance of having recourse to the early and repeated removal of fluid by paracentesis, in cases of ascites associated with cirrhosis.

7. **Local applications** are frequently of service in hepatic affections, especially to relieve pain and congestion. They include chiefly dry heat; poultices and fomentations, to which anodynes may be added; sinapisms; anodyne plasters; dry-cupping, or the removal of a little blood by leeches or cupping.

8. It is desirable to look to the condition of **other organs**, and treat them if required, particularly the heart, a diseased state of which may be the immediate cause of hepatic symptoms. The kidneys also demand due attention.

9. The treatment of **hydatid tumour** requires separate consideration. For the cure of this complaint operative interference is needed, no known drug having any influence upon the parasite, and a spontaneous cure being extremely rare. It is only, however, when the growth attains some size, and becomes a source of trouble, that this course of treatment should be adopted, though it should not be delayed for too long a period. There is much difference of opinion as to the most efficient plan of operation. The principal methods advocated are:—1. Puncture with the aspirateur, or by means of a trochar and canula, and evacuation of the fluid. 2. Puncture and subsequent injection of the cyst with some irritating liquid, such as bile or tincture of iodine, with the view of exciting inflammation. 3. Removal of the contents through a large incision. 4. Gradual opening of the cyst, by the repeated application of caustic potash to the abdomen, over the

most prominent part of the tumour. This plan has been adopted with the view of causing adhesions to form, and thus preventing the escape of fluid into the peritoneum ; and it has also been had recourse to for the same object previous to puncture with the trochar. 5. Puncture of the tumour with needles, and transmission of electric shocks through it. Some authorities assert that all that is necessary is to evacuate the fluid, and that then the parasite will die. Others consider that it is necessary to excite inflammation. The balance of evidence seems to be certainly in favour of the more simple methods. Some recommend the employment of a very small trochar, others of a large one ; again, there is a difference of opinion as to whether it is requisite to remove the whole of the fluid or not, some even using an exhausting syringe to draw this off. Murchison advocated the employment of a very fine trochar, and advised that the canula should be removed before the whole of the fluid has been drawn off, or as soon as it ceases to flow in a full stream, first passing a wire through the tube to ascertain that it is not stopped up by a hydatid vesicle. The object of this plan is to prevent the entrance of air, which is one of the main dangers, as it tends to set up suppuration. Another danger is the escape of fluid into the peritoneum ; and in order to prevent this mishap, pressure should be made over the punctured portion of the abdomen during the removal of the canula. The opening should be made over the most prominent part of the tumour. The administration of chloroform is not advisable, but local anæsthesia may be induced. After the operation the opening is to be closed with lint steeped in collodion, over which a compress and bandage should be applied. Absolute rest is necessary for two or three days ; and an opiate should be given at once, and repeated if necessary. The fluid may collect again, and it may be requisite to repeat the operation. Murchison, however, cautions against doing this too soon, as the enlargement may be due to inflammatory effusion. In cases which are ultimately successful, a considerable degree of fulness may remain for some months. Should the tumour be very large, its walls are likely to be thicker and less elastic, and then it appears desirable to use a large trochar. A free incision is only admissible when suppuration has taken place ; or a large trochar may be used under such circumstances, and an elastic tube left in, the cyst being washed out with carbolic acid solution. The different events which may happen in connection with hydatid tumour must be treated on ordinary principles. In those countries where hydatid disease is prevalent, *prophylactic* measures are necessary, viz., to prevent dogs from feeding on the offal of sheep ; to exclude them from slaughter-houses ; to give them meat thoroughly boiled ; to destroy their excreta which contain tape-worms ; and to physic them periodically. (Murchison.)

10. The treatment of **gall-stones** also calls for a few remarks. During the passage of a gall-stone the chief measures to be carried out are :—*a.* To administer *narcotics* and *anodynes*, especially opium or morphia in full doses, subcutaneous injection of the latter being very valuable ; belladonna ; hyoscyamus ; or chloroform and ether, either internally or by inhalation. *b.* To treat certain symptoms, especially vomiting and collapse. *c.* To apply dry heat, hot fomentations, poultices, or anodyne applications constantly over the hepatic region ;

or to put the patient in a warm bath. Antimony and other *emetics*, which were formerly much employed, partly with the view of mechanically expelling the calculus, as well as strong purgatives, ought certainly to be avoided, in my opinion. Much good is effected in some cases by the treatment introduced by Dr. Prout, of making the patient drink a considerable quantity of a warm solution of bicarbonate of soda (3i or 3ii to Oj). Large warm enemata may also prove beneficial. The application of a few leeches over the hepatic region seems to be useful in prolonged cases, especially if there is much tenderness. For the *prevention* of gall-stones attention to diet and hygiene is most essential; and the use of remedies which improve the condition of the alimentary canal, or of those which act upon the liver, is also often of much service. It has been supposed that hepatic calculi can be dissolved after their formation, by the administration of a mixture of turpentine and ether, chloroform, alkalies, or alkaline mineral waters. It is very doubtful whether either of these agents has any such effect, but alkalies and mineral waters often do a great deal of good in other ways in cases of gall-stone. The various consequences which may result from gall-stones must be treated as they arise. Inflammation involving the *gall-bladder*, from whatever cause, requires the application of poultices and fomentations. If pus forms, or if in chronic cases much fluid collects, it is sometimes requisite to puncture the cyst, and allow the fluid to escape, leaving an external fistula.

CHAPTER XXXIV.

DISEASES OF THE SPLEEN.

A. CLINICAL CHARACTERS.

1. The spleen is often diseased without giving rise to any local **morbid sensations**. When it becomes much enlarged, it may cause a sense of fulness and tension, which is chiefly felt about the left hypochondrium. Occasionally more or less pain and tenderness are complained of in connection with splenic diseases.

2. A most important indication of splenic disease is derived from the **constitutional condition**. In prolonged chronic cases a state known as *splenic cachexia* is induced. This is characterized by extreme anæmia, the mucous membranes being pale and bloodless, and the face presenting a waxy, or sometimes an earthy and sallow aspect; great debility; wasting, but not usually rapid; a sense of prostration and dulness; shortness of breath on any exertion, with hurried breathing, chiefly due to the anæmia; tendency to hæmorrhages, especially in the form of epistaxis, bleeding from the gums, and petechiæ under the skin; and œdema of the legs and eyelids, or even general dropsy.

3. Symptoms may arise from **pressure by an enlarged spleen** on surrounding parts, especially on the diaphragm, dyspnoea being thus

increased, or even pulmonary congestion and catarrh induced. Vomiting may also be excited by pressure on the stomach.

4. The chief aid in the diagnosis of morbid conditions of the spleen is derived from **physical examination**. The characters of *splenic enlargement* or *tumour* are as follows :—*a.* In *position* it is extra-pelvic, and occupies mainly the left hypochondrium, being felt to come from beneath the margin of the thorax on that side. In its growth an enlarged spleen tends towards the front of the abdomen, as well as downwards and to the right, so that ultimately it extends into other regions and comes to be superficial, while it can generally be separated posteriorly from the mass of the dorsal muscles. Percussion often shows increase in area of *splenic dullness* upwards towards the thorax, or backwards, but it rarely reaches above the fifth rib, and does not extend as far back as the spine. There is also an undue sense of resistance on percussion; with deficient elasticity of the ribs. *b.* The *form* is usually very characteristic, being more or less that of the spleen exaggerated. The anterior border can be felt to be directed obliquely downwards and towards the right, being sharp and thin, and often presenting one or more notches or shallow excavations. The posterior edge and lower end are rounded. The outline of the spleen may occasionally actually be visible. *c.* As regards *consistence*, the tumour generally feels firm and solid; now and then it gives a sensation of elasticity, but fluctuation is extremely rare. The surface is almost always smooth, but may be irregular. *d.* Another important character of splenic tumour is its great *mobility*. As a rule it can be readily moved in all directions by manipulation; and it is more influenced by the act of respiration than any other tumour, being often felt below the ribs after a deep inspiration, when previously imperceptible. Posture also affects it markedly. *e.* Occasionally a *splenic murmur* is heard.

Some of the difficulties which are met with in recognizing enlargement of the spleen require notice. 1. The organ is often not sufficiently large to come below the margin of the thorax, and can then only be made out by percussion. 2. Even when of some size, it may be kept up by the costo-colic fold of peritoneum, or by adhesions at its upper end. 3. Adhesions may also prevent any mobility, and cause the tumour to become fixed. 4. The enlargement is sometimes so great as to obscure altogether the outline of the spleen, and the characters of its anterior margin, the latter then assuming a vertical direction. 5. Enlargement of other organs may conceal a splenic tumour. 6. Accumulation of flatus in the colon may interfere with its detection. 7. The principal morbid conditions for which enlarged spleen is likely to be mistaken, or *vice versa*, are cancer about the cardiac end of the stomach; enlarged left lobe of the liver; a tumour of the omentum; or an enlargement in connection with the left kidney or supra-renal capsule.

B. SPECIAL DISEASES OF THE SPLEEN.

I. CONGESTION OR HYPERÆMIA.

ÆTIOLOGY.—The spleen readily becomes congested, on account of its great vascularity, and the yielding nature of its capsule. After every meal it is more or less overloaded with blood. *Active* hyperæmia is commonly observed in acute febrile diseases, especially in typhoid and intermittent fevers, and to a less degree in typhus, erysipelas, pyæmia, puerperal fever, and acute tuberculosis. The condition is said to be occasionally vicarious of menstruation. Injury or morbid deposits may also cause it. *Mechanical* congestion of the spleen follows any obstruction affecting the portal circulation, either direct or secondary to chronic heart and lung-affections.

ANATOMICAL CHARACTERS.—The morbid characters presented by a recently congested spleen are enlargement, often considerable, the capsule being stretched and smooth; increase in weight; intense redness of a dark hue; and diminution in consistence, the substance of the organ in some instances being quite pulpy or almost liquid. The amount of blood is much increased; red blood-cells are extremely abundant; and the splenic tissue appears to be augmented in some cases. After long-continued or repeated hyperæmia, the spleen becomes permanently enlarged, hardened, and hypertrophied.

SYMPTOMS.—The only clinical sign of a congested spleen usually observed is that the organ is enlarged, but not as a rule to any great degree, and the size is liable to vary considerably. Occasionally it feels soft, but is generally tolerably firm. There is no spontaneous pain in most cases, but tenderness is common, and may be marked in acute congestion. Temporary general anæmia has been stated to be associated with extreme splenic congestion.

II. HÆMORRHAGIC INFARCTION—SPLENITIS.

ÆTIOLOGY AND PATHOLOGY.—The spleen is one of the organs in which emboli most frequently lodge, giving rise to *hæmorrhagic infarctions*. Some pathologists are of opinion that these infarctions may also arise from the formation of local thrombi within the vessels of the organ. Occasionally considerable inflammatory action is excited, especially when the emboli have septic properties, as in cases of typhus fever or pyæmia, and this is the most frequent cause of *splenitis*. In rare cases inflammation of the spleen results from injury; and it has also been stated to arise from malaria, especially in certain tropical climates; or as an idiopathic affection.

ANATOMICAL CHARACTERS.—Infarctions in the spleen, as seen on section of the organ, are usually in the form of wedge-shaped masses with their bases towards the surface, often projecting somewhat; when situated deeper in the organ they are more or less rounded. They vary considerably in number and size. Originally each infarction is dark and firm, and is surrounded by a zone of congestion; in time, how-

ever, the ordinary changes take place, the colouring matter becoming altered and removed, until the mass assumes a yellowish-white colour. Frequently caseous degeneration with ultimate absorption follows, a depressed cicatrix remaining; or calcification may take place. In pyæmia and allied affections the infarctions rapidly break down into a purulent fluid, at the same time the spleen being more or less inflamed and congested throughout. *Idiopathic* inflammation cannot at first be distinguished from mere congestion, the spleen being enlarged, very dark, and softened. One or more abscesses may form, which sometimes finally involve the entire organ, this being converted into a mere bag of pus. An abscess occasionally bursts externally; or into the peritoneum, stomach, or thorax. Rarely it becomes encapsuled and undergoes curative changes, its fluid portion being absorbed, so that finally only a caseous material remains, which may calcify. The peritoneum corresponding to the affected part is often inflamed.

SYMPTOMS.—Very rarely can splenic embolism and its consequences be recognized during life, but it may be suspected if, along with some source of embolism, there should be rigors and pyrexia, with *local* signs indicating inflammation of the spleen, viz., pain and tenderness in the left hypochondrium; enlargement of the organ; and vomiting in many cases. A splenic abscess is scarcely ever diagnosed; it may possibly give rise to a fluctuating enlargement, or even burst externally. The process of suppuration is attended with hectic fever and rapid wasting. Should the abscess rupture internally, the usual signs of such an event will be observed.

III. HYPERTROPHY—LEUCOCYTHÆMIA.

ÆTIOLOGY AND PATHOLOGY.—By far the most important form of enlarged spleen is that which is due to *hypertrophy* of its tissue. This may follow any long-continued or repeated congestion, but is particularly observed after ague, or even after mere residence in malarial districts; and as the result of chronic portal obstruction. Under these circumstances the hypertrophy seems to be chiefly the consequence of interference with the escape of the cells out of the spleen, and not of their excessive formation. This morbid condition is most important, however, in connection with the disease named *leucocythæmia* or *leucæmia*, which is characterized by the presence of a great excess of white corpuscles in the blood; and by an increase in the lymphatic tissues in certain organs and structures, especially in the spleen and lymphatic glands, but also occasionally in the liver, kidneys, lungs, heart, thyroid gland, supra-renal capsules, and in connection with serous and mucous membranes. Virchow has described two chief forms of the affection, in one of which the spleen alone is enlarged, this being much the more common; in the other only the lymphatic glands being affected. In some instances both are implicated. The increase in the white blood-cells is no doubt mainly due to their excessive formation in the spleen or lymphatic glands, but it has also been attributed partly to diminished metamorphosis of these cells into red corpuscles; to their proliferation in the blood; and to a new formation by the walls of the vessels.

Nothing satisfactory is known with reference to the remote causes of leucocythæmia.

ANATOMICAL CHARACTERS.—In hypertrophy resulting from hyperæmia, the spleen is increased in size and weight, sometimes to a great degree, but retains its normal form; its consistence is increased; and on section it appears pale and dry, sometimes grey, or presents black spots or patches, due to pigment. The tissue is quite normal, but is increased in amount and condensed, the trabeculæ being also thickened and firm, appearing as white traversing lines.

When the *spleen* is involved in leucocythæmia, the organ is at first congested, the cellular elements at the same time becoming increased. Ultimately it may attain enormous dimensions, and may weigh many pounds. As a rule it is abnormally firm, but not invariably. The increase of tissue commences at an early period, chiefly in the Malpighian corpuscles, which become much enlarged, their vessels also increasing in number, and on section of the spleen they are visible as firm, whitish, irregular, scattered nodules, the surrounding pulp becoming more or less atrophied as they extend, as well as often much pigmented. The trabeculæ are also considerably thickened. Usually the capsule of the spleen is thickened and opaque, and adhesions frequently form with neighbouring structures. Hæmorrhagic infarctions or their remains are not uncommonly evident.

When the *lymphatic glands* are affected, they become more or less enlarged, in some cases forming considerable tumours by their aggregation. They resemble in appearance and structure normal absorbent glands, being of a soft consistence, and presenting on section a smooth uniform surface, from which a turbid fluid can be expressed. Their cortical portion is much thickened; and a microscopic examination only reveals that the normal elements of the gland-tissues are in excess.

In the other organs and tissues mentioned, especially the *liver*, the changes associated with leucocythæmia are observed in the form of little whitish spots, which consist of a soft adenoid tissue, composed of small cells and nuclei. The liver may be occupied by considerable masses of this substance, causing it to be enlarged. These deposits are supposed to be mainly derived from infiltration of the tissue with elements conveyed by the blood from the spleen and glands, but probably they are at least in part due to local hyperplasia of the adenoid tissue normally present in the liver.

The changes in the *blood* are highly important. In the *splenic* variety of leucocythæmia this fluid is found to contain an enormous number of ordinary white corpuscles; in the *lymphatic* variety, there are abundant small cells and free nuclei, similar to those present in the glands; and in *mixed* cases, as the disease approaches more towards one type or the other, does the relative proportion of these microscopic elements correspondingly vary. Other characters presented by the blood are marked lowering of its specific gravity; great diminution in the number of red corpuscles, and therefore in the amount of iron; increase of water; and in some instances, according to Scherer, the presence of abnormal ingredients, such as are usually found in the spleen, viz., hypoxanthin, lactic, formic, and acetic acids. The proportion of white corpuscles differs in blood taken from different parts of the body, being

highest in that of the splenic vein. After death soft yellow clots are often found in the heart and great vessels, sometimes presenting an almost purulent appearance.

SYMPTOMS.—Hypertrophy of the spleen may exist for a considerable time, and to a marked degree, without producing any evident disturbance. In many advanced cases, however, striking signs of *splenic cachexia* are developed. *Physical examination* usually reveals quite distinctly the enlarged spleen.

In *leucocythæmia* the essential clinical phenomena may be summed up as:—1. More or less intense *splenic cachexia*, which often attains a high grade. 2. In the majority of cases the *physical signs of enlarged spleen*, in some instances the organ being hypertrophied to such a degree as to lead to general enlargement of the abdomen. 3. In a comparatively few cases *enlarged masses of lymphatic glands*, either externally, within the cavities of the body, or in both places; and occasionally signs of *enlarged liver*. 4. Sometimes evidences of *pressure* by the spleen on surrounding structures, especially the diaphragm. 5. Peculiar changes in the *blood*. It is customary to describe the characters of the blood and of the clot obtained after a small venesection, but patients suffering from leucocythæmia cannot afford to lose blood, and it is quite sufficient to prick the finger so as to get just a drop of this fluid, and examine it microscopically, when the increase in white corpuscles is immediately perceptible. As a rule no subjective sensations are complained of in the abdomen, except a sense of weight and fulness, but transitory pains may be felt. Digestive derangements are of frequent occurrence, and vomiting and diarrhoea may be prominent symptoms. Increased excretion of uric acid has been observed. The *course* of the disease is very chronic. Usually pyrexia is absent in its earlier stages, but there may be some irregular febrile disturbance, and towards the close the temperature is often raised persistently. Death may take place gradually from asthenia and exhaustion, frequently preceded by delirium, stupor, and coma; or more speedily as the result of hæmorrhage, diarrhoea, or other complications.

IV. RARE MORBID CONDITIONS.

1. **Albuminoid Disease.**—For the *ætiology*, *morbid anatomy*, and *constitutional symptoms* of this condition, reference must be made to the general account already given (Vol. I., pages 74–77). All that need be said here is, that the deposit in the spleen is in some cases limited to the Malpighian corpuscles, producing the appearance known as the *sago-spleen*, in which translucent granules are observed, resembling boiled sago. *Clinically* enlargement of the spleen from albuminoid disease is recognized by its very hard and dense consistence; and by its steady growth, the organ finally reaching extreme dimensions in some cases. Other organs are always involved; while there is some constitutional condition present with which albuminoid disease is associated.

2. **Syphilitic Disease.**—In rare instances of congenital syphilis the spleen is much enlarged and firm. In one case which came under

my notice the organ reached nearly to the crest of the ilium, presented a firm and sharp margin, and was freely movable.

3. **Cancer** of the spleen is almost a curiosity. It occurs in the form of nodules or masses of encephaloid, and is always secondary. During life the enlargement is recognized by its irregular form, and nodular character. Usually pain and tenderness are complained of. Other organs are always implicated.

4. **Hydatid tumour** has been in rare instances met with in the spleen, the liver being affected at the same time.* It may give rise to a prominent tumour, having the usual semi-globular shape and fluctuating sensation of a hydatid cyst.

5. **Tubercle** in the spleen is chiefly met with as a part of acute miliary tuberculosis. In rare instances it has been observed in cases of chronic phthisis. This condition cannot be recognized clinically.

6. The spleen is often **shrunk** and **atrophied**, but this leads to no obvious ill-effects.

C. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. **DIAGNOSIS.**—Practically it is only by *physical examination* that diseases of the spleen can be positively recognized. The chief difficulties in the diagnosis of splenic enlargement have already been indicated. The *general symptoms* aid the diagnosis materially in advanced cases. In *leucocythæmia* of course examination of the blood is highly important. The *previous history* also helps in some cases, especially if it reveals exposure to malarial influence, or the previous occurrence of attacks of ague. Should there be portal obstruction, more or less enlargement of the spleen is a necessary consequence.

2. **PROGNOSIS.**—*Acute* affections of the spleen are rarely dangerous in themselves. *Chronic* affections are usually slow in their progress, except in the case of malignant disease, and if there is mere hypertrophy the health is often not disturbed for a long time. Treatment has usually but little effect in reducing this hypertrophy. *Leucocythæmia* has been considered an incurable disease, but recent experience has proved that it may be greatly benefited. The complaint lasts a variable time, being usually chronic in its progress, but its average duration is said to be from 13 to 14 months.

3. **TREATMENT.**—No special interference is needed in *acute* forms of splenic disease, unless an abscess should form and be recognized, which must be treated in the usual way. A case has been recorded in which 8½ ounces of a dark grumous fluid were removed by aspiration from a spleen which was the seat of softening from acute inflammation. Quinine has a marked influence in reducing *malarial congestion* and its consequences, even after it has existed for some time. When there is *mechanical congestion*, any impediment in connection with the portal circulation must be removed, if possible; but if this is not practicable, *saline purgatives* act beneficially, by relieving the vessels. In *hypertrophy* and *leucocythæmia* one of the chief objects of treatment is to improve the general health, and the condition of the blood, by the administration of iron, mineral acids, quinine, and similar remedies;

as well as by a nutritious diet, change of air, and attention to hygienic measures. Iodides and bromides have been supposed to reduce the size of the spleen, but in my experience they have been of no use whatever. Cases of *leucocythæmia* have been remarkably benefited by the use of phosphorus. In a case under my own care, the administration of this drug seemed to have a marked effect in reducing the size of the spleen and of enlarged glands, and in diminishing the number of white corpuscles in the blood. It tends, however, to produce fatty changes in organs and other untoward effects. Friction over the corresponding region with iodide of mercury ointment has been recommended with the view of reducing the size of the spleen. The use of galvanism has also been found to have a marked influence in this direction. Extirpation of the organ has been advocated as a last resource. Various symptoms must be treated as they arise.

CHAPTER XXXV.

DISEASES OF THE PANCREAS.

I. CLINICAL CHARACTERS.

1. Pancreatic affections are frequently attended with **painful sensations**, which are described as lying deep in the abdomen, a little below the epigastrium. The pain often shoots in various directions, and occasionally comes on in violent paroxysms, resembling those of hepatic colic. In some cases, there is deep tenderness.

2. Important symptoms are believed to arise from changes in the quantity or quality of the **pancreatic secretion**. When formed *in excess*, being at the same time usually of an irritable quality, this secretion is supposed by some to be the cause of a form of pyrosis, attended with the discharge of a viscid, slimy fluid; as well as of diarrhoea, the stools containing a tenacious material, or presenting sometimes dysenteric characters. On the other hand, *deficiency* or *absence* of pancreatic juice from the alimentary canal, whether arising from changes in the gland-tissue, or obstruction in connection with the duct; and *abnormal quality* of the secretion, have been considered to give rise to a characteristic phenomenon, namely, the passage of a large amount of fatty or oily matter in the stools, which separates from the general mass of the fæces. Frequently there is constipation at the same time, the fæces being dry and hard. Other digestive derangements are common, and may be partly due to the absence of pancreatic juice from the bowels.

3. **Pressure** upon or **irritation** of neighbouring structures is often a cause of prominent symptoms in pancreatic disease, especially jaundice; vomiting, eructations, and other gastric disturbances; and aortic pulsation. Pain is also partly due to this cause in many cases,

resulting from pressure on the nerves in the vicinity or on the vertebræ, the latter being occasionally eroded.

4. **Physical examination** may reveal certain morbid conditions of the pancreas, but it requires to be performed very thoroughly, and in many cases repeatedly, the stomach and colon being empty, before a satisfactory conclusion can be arrived at. The healthy pancreas can now and then be felt on making deep pressure, in very thin persons with loose abdominal walls, especially if the spine is somewhat curved forwards; this is more frequently the case when the organ is enlarged and hardened. It is, however, in the detection of a *tumour of the head of the pancreas* that physical examination is of most value. This is distinguished by the following characters:—*a.* It is situated deeply at the back of the abdomen, in the region of the pancreas. *b.* The dimensions are always small; and the shape generally more or less rounded. *c.* The tumour is quite fixed. *d.* It feels dense and hard. It must be mentioned that marked pulsation and bruit may result from pressure of the pancreas upon the aorta.

5. Pancreatic disease is often attended with **general symptoms**, namely, extreme emaciation, anæmia, and debility, due to interference with nutrition and other causes.

II. SPECIAL DISEASES OF THE PANCREAS.

These need but a very brief consideration, and some of them only require enumeration.

1. **Pancreatitis**.—Acute inflammation of the pancreas is very rare. It is said to be characterized anatomically by hyperæmia; swelling; induration or softening; and exudation into the cellular tissue and upon the surface, occasionally ending in purulent infiltration or the formation of abscesses. The last event is said to be not uncommon as the result of metastasis from the salivary glands and testis. Very rarely the inflammation ends in gangrene. The *symptoms* are described as dull deep-seated pain in the region of the pancreas; nausea and vomiting of a viscid liquid; thirst; constipation, and some degree of pyrexia. Rupture of an abscess may give rise to serious symptoms.

2. The following morbid conditions may be mentioned together, viz.:—(i.) So-called **hypertrophy**, which generally involves the entire gland, and is the result of *chronic inflammation*, or of long-continued *mechanical congestion* from portal obstruction, the pancreas being enlarged and hardened. This organ is said to be not uncommonly hypertrophied in cases of diabetes. (ii.) **Atrophy**, usually associated either with senile changes; some kind of cachexia; local disease of vessels; or pressure upon the organ as the result of surrounding disease. (iii.) **Induration or softening**, with or without hypertrophy or atrophy. (iv.) **Fatty infiltration and degeneration**. If these conditions give rise to any symptoms at all, they are those indicative of deficiency or abnormal quality of the pancreatic secretion. A hypertrophied pancreas may be felt in some cases; and occasionally it gives rise to pressure-symptoms.

3. Not uncommonly **calculi** form in the pancreatic duct, which may

be in large numbers and of some size. They interfere with the escape of the secretion. I am not aware that their passage causes any symptoms. The branches of the pancreatic duct are sometimes dilated into cysts.

4. The most important disease of the pancreas is **scirrhus of the head** of this organ. There is a difference of opinion as to the nature of this morbid condition, some pathologists regarding it as *scirrhus cancer*; others considering that it is merely due to *fibroid changes* resulting from *chronic inflammation*, and the latter affirm that the pancreas is peculiarly free from cancer, escaping often even when the disease involves all the surrounding structures. I have had the opportunity of observing several cases of this disease, and of making a *post-mortem* examination in four of these cases, in which certainly the affected portion of the pancreas presented well-marked general and microscopic characters indicative of scirrhus cancer. The mass varies in size, but does not attain large dimensions; it has an extremely hard and dense consistence, and a whitish section. It frequently becomes adherent to, or even involves the duodenum, which may be ulcerated and greatly narrowed. It may also form adhesions with other structures, to which the disease may subsequently extend. The pancreatic and common bile-ducts as a rule become obstructed. The latter is usually supposed to be closed owing to pressure being exerted upon it by the enlarged pancreas, but this effect is probably more frequently due to contraction about the orifice or in the course of the duct, from changes in its own tissues, jaundice and its accompanying phenomena necessarily resulting. The body of the pancreas is usually enlarged; sometimes it is atrophied. Now and then serious disorganization of neighbouring parts is occasioned, leading to erosion of the vertebræ, perforation of the diaphragm, or the opening of a large vessel.

But little is known about the *ætiology* of this disease. Generally it occurs in elderly persons, but one of the most marked cases I have met with was in a young man aged 23. In only one instance was there any history of intemperance.

SYMPTOMS.—The clinical history of *scirrhus of the pancreas* is decidedly indefinite and uncertain. In general terms the clinical phenomena may be stated as deep pain in the region of the pancreas, aching, gnawing, or lancinating in character, or sometimes attended with a sense of burning or tightness, in some cases greatly increased paroxysmally, and also frequently intensified by food, coughing, deep breathing, movement, or the supine position; deep tenderness; nausea and vomiting, in some cases of a severe character; various digestive disturbances, the tongue, however, being often quite clean; jaundice, frequently intense; the passage of much fat in the stools, the bowels being usually constipated; the detection of a tumour having the characters already described; accompanied with great general wasting, **anæmia**, and debility. As showing the irregular and ill-defined clinical history of cases of this disease, I may state from my own observation that there may be no pain or tenderness from first to last; that symptoms due to biliary obstruction may be the only prominent phenomena throughout; that it may be impossible to detect any tumour; and

certainly that excess of fat in the stools is by no means always observed.

5. Among exceedingly rare morbid deposits which have been found in the pancreas are mentioned **encephaloid cancer, colloid, melanosis, and tubercle.**

DIAGNOSIS.—Only *scirrhus of the head of the pancreas* can be diagnosed with any approach to certainty, and in many cases it is exceedingly difficult to arrive at any positive conclusion, at all events for some time. The chief diseases for which this condition is liable to be mistaken are affections of the stomach, especially about the pylorus; of the duodenum; or of the liver. The paroxysms of pain may closely resemble those associated with the passage of a gall-stone. Occasionally, by pressing on the abdominal aorta, scirrhus of the pancreas gives rise to pulsation and bruit, simulating an aneurism. Whenever any of the symptoms above mentioned are complained of, and especially jaundice coming on without any obvious cause, pancreatic disease should always be borne in mind. I believe that it not uncommonly escapes recognition simply because it is never thought of. An important step towards a correct diagnosis consists in excluding as far as possible affections of all neighbouring structures. It must be remembered that the liver is liable to be enlarged, as the result of obstruction of its duct associated with pancreatic disease. *Physical examination* is of essential value in diagnosis, and in doubtful and obscure cases it should be thoroughly carried out again and again, by which means a satisfactory conclusion may in some instances be arrived at in course of time.

PROGNOSIS is necessarily serious in cases of scirrhus of the pancreas, the disease being fatal, and seldom of long duration.

TREATMENT must be entirely *symptomatic*, directed especially against pain, vomiting, jaundice, loss of flesh and strength, anæmia, and debility.

CHAPTER XXXVI.

DISEASE OF THE SUPRA-RENAL CAPSULES— ADDISON'S DISEASE.

ÆTIOLOGY AND PATHOLOGY.—Dr. Addison first drew attention to a series of symptoms which he believed were associated with disease of the supra-renal bodies, one of the most prominent being a peculiar discoloration or *bronzing of the skin*. Since his time the subject has been investigated by many observers, but there are several points bearing upon the pathology of this complaint which are still very doubtful. In the Croonian lectures for 1875, Dr. Greenhow discussed the various questions at length, and for complete information the reader is referred to these lectures, or to the work in which they have been more recently embodied.

The first question to be determined is, whether any relation exists between the phenomena of so-called *Addison's disease* and a morbid con-

dition of the *supra-renal capsules*? Greenhow maintains that there is such a relationship, but others deny this. With regard to the *bronzing of the skin*, which, however, is by no means the most important or an essential symptom of Addison's disease, this has been described as being present in cases where there was no supra-renal mischief, but Greenhow affirms that the discoloration in these instances was different from true bronzing. On the other hand, supra-renal disease has been frequently noticed where there was no bronzing, which might be accounted for in some instances by the fact that this symptom appears at a comparatively late period, and that the progress of the complaint may be so rapid as to terminate in death before the discoloration could be developed. But, further, this leads to the question of the *nature* of the lesion of the supra-renal capsules in Addison's disease. Some suppose that its phenomena may be due to any morbid condition of these organs; but Greenhow holds that they are only observed in connection with a *special* lesion, which will be presently described. As to the *mode* in which disease of the supra-renal capsules produces these effects, there is strong evidence to prove that it is not through any mere destruction of their tissues, and abolition of their functions, whatever these may be. These organs have a large supply of nerves, which are intimately connected with the trunk of the sympathetic in the abdomen, as well as with the phrenic and pneumogastric nerves, and through these with the cerebro-spinal centres. The morbid changes which affect the supra-renal capsules also tend to involve the nerves in their vicinity, and may even extend so far as to implicate the semilunar ganglia and solar plexus. It seems highly probable that the phenomena of Addison's disease are attributable to this implication of such important nerves, which are first irritated, and subsequently become atrophied and destroyed. This is borne out by the fact that bronzing of the skin has been found in connection with enlargement of the retro-peritoneal absorbent glands, which surrounded and compressed the solar plexus, the supra-renal capsules being perfectly healthy. The nerve-lesions have been considered by some observers as arising *primarily*, and as being altogether independent of supra-renal mischief.

With respect to the *exciting cause* of the special supra-renal lesion, Greenhow states that it is frequently due to the extension of inflammation from diseased or injured adjacent parts. It has also been referred in some instances to a severe strain, blow, or physical shock, usually in the back; over-exertion; nervous shock, grief, or anxiety; and intermittent fever.

There are some important *predisposing causes* of Addison's disease. It is much more frequent among males; is found almost exclusively in those employed in active manual labour, and especially in connection with those occupations which entail exposure to bodily injury from accident or over-exertion; and is almost confined to the laborious periods of life. There may be a predisposing *constitutional condition* in some instances.

ANATOMICAL CHARACTERS.—The supra-renal bodies may be the seat of the following morbid changes:—1. *Acute inflammation*, ending in suppuration. 2. *Tubercle*. 3. *Cancer*, always secondary, and usually of the encephaloid variety. 4. *Albuminoid disease*. 5. *Fibroid degener-*

ation, with hardening. 6. *Fatty degeneration.* 7. *Atrophy.* 8. *Hæmorrhage.* 9. *Peculiar alterations* associated with *Addison's disease.* Only the last need be described, and the changes observed are supposed to be the result of a *chronic inflammatory* process, the organs becoming infiltrated with an exudation of a low type, which is converted into a firm fibrous material, and this undergoes degenerative changes, along with the tissues of the supra-renal capsules, which it invades and destroys. The affected organs are usually enlarged, firm, and nodulated; though in rare cases they are normal or diminished in size. In the early stage of the disease they are invaded by a softish, semi-translucent, greyish or greenish-grey, apparently homogeneous substance, which on exposure to the air assumes a pinkish hue. This becomes firmer, and undergoes caseous degeneration, giving rise to yellowish, opaque, cheesy nodules; or, not uncommonly, forming a creamy or purulent-looking fluid, varying in thickness, and occupying either one large cavity in the centre of the capsule, or, more frequently, several small cavities. Sometimes calcification follows, cretaceous granules or small masses being formed, or a putty-like material, or finally a dry chalky mass. The grey material and the products of degeneration are always found associated together, though in very variable proportions, and gradations may be seen from one to the other. Under the microscope the former is observed to consist of a fibrillated stroma containing numerous lymphoid corpuscles; while the caseous masses are made up of altered cells, nuclei, granular matter, and fat. In many cases there is great thickening of the covering of the capsules, with extensive proliferation of the surrounding cellular tissue, and the formation of firm adhesions to adjacent organs; the nerves become thus invested in a dense indurated tissue, and their fibrous investment has also been found hypertrophied.

Other morbid appearances have been described in different cases of Addison's disease, including enlargement of the neighbouring absorbent glands, which are either normal in structure, or firm, glistening, pale, and in process of caseation; enlargement of the solitary glands of the small intestines, and sometimes of the large; mammillation, small ecchymoses, superficial erosions, or small ulcers in the stomach; atrophy of the mucous coat of the alimentary canal, with degeneration of its glands; and enlargement of the spleen, which may be considerable, the organ being usually dark-coloured and soft. Dr. Greenhow states that the composition of the blood does not undergo any important alteration in uncomplicated cases of this complaint.

SYMPTOMS.—One of the most prominent clinical phenomena of Addison's disease consists in a *peculiar cachexia*, which sets in gradually and indefinitely without any obvious cause, characterized by increasing muscular debility, languor, and indisposition for any bodily or mental effort, at last amounting to extreme prostration; an aspect of listlessness and depression; marked anæmia, the sclerotics being pearly-white; wasting, but not to any degree, nor is it always observed, while there is often a peculiar tendency to the formation of fat, the subcutaneous fat being in some cases very abundant; remarkable feebleness of the heart's action, the pulse becoming very soft, usually weak, and compressible, there being also a tendency to giddiness and faintness, sometimes

amounting to prolonged attacks of syncope, and to palpitation on exertion, with breathlessness. Another characteristic feature is a gradual discoloration of the skin, which assumes the so-called *bronzed* appearance. This appears at very variable periods in different cases, and is due mainly to the presence of yellowish-brown pigment-granules in the *rete mucosum*, or occasionally of pigment-cells. Traces of pigment may also be found in the superficial layers of the epidermis, with pigment-granules here and there in the cutis. The exact hue varies, and it becomes darker by degrees. It often resembles that of a mulatto, but may be simply dingy or smoky, brown, yellowish-brown, greenish-brown, greyish-black, or almost black. It extends all over the body, but is never uniform throughout, usually commencing and being most marked over exposed parts, such as the face and neck; on the upper extremities; in the axillæ; and about the penis, scrotum, and navel. It shades off gradually, but where the skin has been injured or irritated, this part becomes much darker and presents defined margins. The palms and soles sometimes exhibit spots of pigment. The *mucous membranes* are also discoloured, the lips in some instances assuming a mulberry hue; or irregular and ill-defined spots and patches of pigment being observed upon them, as well as on the inside of the cheeks and on the gums, with dark streaks opposite the angles of the mouth. A peculiar pigment has also been described in the *structures of the eye*, as seen with the ophthalmoscope, but the conjunctivæ always remain normal. In addition to these symptoms there is usually more or less *pain in the epigastrium*, in some cases extremely severe; and *irritability of the stomach*, with nausea, retching, or vomiting, which may be urgent and irrepressible. Other digestive disorders are also common, appetite being lost, and obstinate diarrhoea sometimes sets in, though constipation is the rule. The tongue is usually red and moist. Pain in the loins is often complained of. Frequently one or both hypochondria feel tender, and Dr. Greenhow has noticed sometimes a rigidity of the abdominal muscles, as if they were instinctively contracted to protect deep-seated parts from pressure.

The *course* of Addison's disease is slow and chronic as a rule, but it is often subject to remarkable remissions, with improvement in the symptoms, and subsequent exacerbations. In exceptional instances the progress is acute and rapid; or the disease may be latent for a long time, and then run a very rapid course. Death generally results from gradual asthenia, there being towards the close frequent sighing or yawning, with persistent hiccup. The mind is in many cases clear to the last, but the patient may be drowsy or semi-comatose, or grave nervous phenomena may arise. The temperature is usually low throughout, but towards the close it falls considerably, the skin being cool or cold. The urine is often diminished; of low specific gravity; and deficient in solids.

DIAGNOSIS.—It is only necessary to mention that should symptoms of failing health and cachexia appear, without any evident organic mischief to account for this, Addison's disease ought to be remembered. When the bronzing appears, there should be no doubt respecting the nature of the complaint.

PROGNOSIS is very grave, the disease always ending fatally, but the duration may be very prolonged.

TREATMENT.—All that can be done is to promote general health and strength by means of a highly nutritious diet ; by the administration of *tonics*, especially quinine, tincture of steel, or syrup of the phosphate of iron, strychnia and cod-liver oil ; by attention to hygienic measures ; and by maintaining the alimentary canal in good order. Rest, and the avoidance of all bodily and mental excitement are also important elements in treatment. Symptoms must be attended to as they arise.

CHAPTER XXXVII.

ABDOMINAL ANEURISM.

THE most important form of abdominal aneurism which comes under the notice of the physician is that which is connected with the aorta, but an aneurism may be found on the cæliac axis or either of its branches, especially the hepatic ; on either of the mesenteric or renal arteries ; or on one of the iliac vessels. For the *pathology* and *anatomical characters* of this condition, reference must be made to the chapter on thoracic aneurism.

SYMPTOMS AND SIGNS.—In many cases the only clinical indications of abdominal aneurism consist in the detection of a *tumour*, presenting the usual *physical characters* of an aneurism. Often, however, there are signs of pressure on surrounding structures ; local morbid sensations ; and evidences of serious constitutional disturbance. In some instances such phenomena are alone present, there being no physical signs of an aneurism, or only such as are very obscure. The *physical characters* of an abdominal aneurismal tumour are as follows :—1. It is usually seated in some part of the course of the aorta, but frequently projects more to one side than the other, especially towards the left. Of course an aneurism may occupy other regions, corresponding to the particular vessel affected. 2. As a rule the shape is more or less rounded ; the surface is smooth ; and the tumour yields somewhat on being compressed. 3. Almost always the aneurism is quite fixed and immovable, being unaffected by respiratory movements, though if it is very large it may interfere with these movements. 4. One of the most important characters is the presence of more or less *pulsation*, synchronous with the cardiac systole usually, but sometimes also diastolic ; distinctly expansile ; tending laterally as well as forwards, and not uncommonly more towards one side than the other ; and occasionally attended with a thrill. 5. Percussion reveals *dulness*, corresponding to the extent of the tumour ; with a sense of much *resistance*. 6. In many cases there is a *systolic murmur*, which is sometimes very loud and harsh, but it is by no means always heard, or may be very slight, or more like an arterial sound ; and occasionally a murmur is seated beyond the aneurism. There is never any diastolic bruit. The murmur is often influenced considerably by posture and pressure.

There are a few points of practical importance which demand notice.

1. The signs of an abdominal aneurism may be most evident in the back, and it is always essential to make careful examination in this region should this disease be suspected. Sometimes there is no obvious sign, except a murmur in this region. 2. There is no relation between the size of an aneurism and the degree of pulsation, or the loudness of a murmur. 3. Occasionally the tumour is movable; and not uncommonly both pulsation and murmur are considerably influenced by posture, it being on this account necessary to examine the patient in different positions. It is important, however, to observe, that the impulse does not disappear when the patient is placed in a kneeling attitude, supported by the hands. 4. The physical signs may change considerably during the progress of any particular case.

The *pressure-symptoms* will vary with the situation of the aneurism. Among the most common are neuralgic pains, sometimes extremely severe, and shooting in different directions, originating in pressure upon nerves, such pressure also occasionally causing permanent contraction of the flexors of the hip-joint; deep gnawing pain, from erosion of the vertebræ; and anasarca of one or both legs, with distension of the superficial veins, due to pressure on the vena cava or on one of the iliac veins. In some cases micturition is affected at times; and albuminuria may be induced as the result of pressure on the renal veins. Wasting of the testis has been noticed, in consequence of obliteration of the spermatic artery. Aneurism of the *hepatic artery* must be borne in mind as a possible cause of jaundice and ascites, in consequence of producing pressure upon the neighbouring duct and portal vein.

In some instances a subjective feeling of uncomfortable pulsation is experienced. The alimentary canal is often out of order, and I have known obstinate constipation to be the one prominent symptom complained of in a case of aneurism of the abdominal aorta. Patients suffering from this disease frequently look well, and their general condition is often satisfactory; but sometimes they present a very peculiar aspect, indicating profound illness with anæmia, even when there are no distinct physical signs of the aneurism.

DIAGNOSIS.—The chief conditions which may simulate abdominal aneurism are:—1. Simple aortic pulsation. 2. The pancreas or a solid tumour transmitting an impulse from the aorta; or giving rise to a murmur by pressing upon the vessel. 3. A fluid accumulation, such as hepatic abscess or hydatid tumour, receiving and communicating an impulse from the aorta. The differential diagnosis must be founded on a careful consideration of the case in all its details, as regards history, symptoms, and physical signs; but it is important to notice that in all the conditions just mentioned which simulate aneurism, any pulsation observed is but rarely expansile, while both it and any murmur which may be audible generally disappear if the patient is placed in a kneeling attitude, supported on the hands. The diagnosis from mere *aortic pulsation* requires a few words of special comment. The chief facts in favour of this condition are as follows:—1. The pulsation is generally seated in the epigastrium. 2. It is observed most commonly either in highly nervous and anæmic persons, especially women; or in very thin individuals; or in those who suffer much from chronic dyspepsia.

3. There are no signs of pressure ; nor is there any pain or tenderness as a rule. 4. The impulse is scarcely ever expansile and lateral, but merely tends in a forward direction, and is never attended with a thrill ; there is no increase in dulness, or any evident tumour ; and if a murmur is present, it is soft and blowing or whiffing in quality, but never harsh or loud. Some cases are difficult to diagnose with certainty, and then their progress must be watched, and the effects of treatment observed.

It must not be forgotten that an abdominal aneurism may exist without giving rise to any physical signs. Occasionally, also, it presents the characters of a solid tumour, having neither pulsation nor bruit. If obscure abdominal symptoms are complained of, particularly deep pain near the spine ; and especially if there are at the same time indications that the constitution is gravely disturbed, aneurism should be thought of, and careful *physical examination* carried out repeatedly, over the back as well as in front of the abdomen.

TREATMENT.—In addition to what has been previously stated regarding the treatment of internal aneurism (Vol. ii. page 78), it is necessary to allude to a special method introduced for the cure of aneurism of the abdominal aorta, viz., the *rapid-pressure* treatment, first employed by Dr. William Murray, of Newcastle-on-Tyne. This plan consists in keeping the patient well under chloroform, applying a tourniquet over the aorta above the tumour, and maintaining steady and constant pressure until all pulsation has ceased in the aneurism on removing the tourniquet. The blood coagulates in the sac, and afterwards collateral circulation is set up. The results of this treatment have certainly been such as to commend its adoption in appropriate cases, if other measures do not appear to be followed by good effects. If the aneurism is situated high up, distal pressure may possibly be of service. Tuffnell's method has proved efficacious in the treatment of some cases of abdominal aneurism.

Pain is a symptom often calling for interference in cases of this disease, and it is best relieved by subcutaneous injection of morphia. Posture may influence considerably the severity of the pain. It is highly important to attend to the state of the digestive organs, and to keep the bowels acting regularly by means of mild aperients. A belladonna plaster may be worn constantly over the aneurism.

CHAPTER XXXVIII.

DISEASES OF THE URINARY ORGANS.

CLINICAL CHARACTERS.

1. The **morbid sensations** connected with the urinary organs may be referred to one or both lumbar regions ; to the course of the ureters ; to the hypogastrium ; or to some part of the urethra. They

chiefly include different kinds of pain, tenderness, uneasiness, a sense of fulness or tension, heat or burning along the urethra, and itching or tickling at the end of the penis. With respect to pain, it is important to ascertain whether it is increased by movement of the body, especially by sudden jolts, as after walking, jumping, riding, or driving; if it is affected by the act of micturition, being either relieved or intensified, or even only complained of during or after this act; and if it is influenced by any articles of food or drink. Not uncommonly a sympathetic pain is felt running along the spermatic cord to the testis; and this organ may be retracted.

2. The **act of micturition** is frequently disturbed. The principal deviations are a too frequent or almost constant desire to pass water, sometimes coming on suddenly, so that the patient cannot retain the urine for an instant, or, on the other hand, being combined with more or less dysuria or strangury; simple *dysuria*, or difficulty of micturition, even to complete retention; and *incontinence*, the urine coming away involuntarily, either constantly or only at times, and especially at night during sleep. The stream of urine may present abnormal characters. The amount passed may also vary greatly from the standard of health, being either diminished more or less to actual suppression—*oliguria*, and *anuria* or *ischuria*; or increased.

3. Important symptoms which are frequently associated with certain urinary affections result from the **abnormal state of the blood** which they induce, of which the most prominent are *dropsy*, and the phenomena grouped under the term *uræmia*. The latter condition will be presently discussed in detail.

4. When the kidney is enlarged, it occasionally gives rise to symptoms by causing **pressure** upon adjoining structures.

5. **Rupture** of any portion of the urinary apparatus will occasion serious consequences, especially when this event is followed by extravasation of urine.

PHYSICAL EXAMINATION.

Physical examination in connection with the urinary organs includes:—

I. **Examination of the urine.** II. **Investigation for renal tumour.** III. **Examination directed to the bladder and urethra**, by external methods; by the use of the catheter, sound, or endoscope; and through the rectum or vagina. For an account of the special examination of the bladder and urethra reference must be made to surgical treatises, but it will be desirable to point out in this work the physical signs of a distended bladder. It should also be mentioned that in cases of renal disease it is of considerable importance to examine the **heart and arteries**, and to make use of the **ophthalmoscope**.

I. Examination of the Urine.

Examination of the urine is a matter of the deepest importance, and is even at the present day but too much neglected in ordinary practice. It gives valuable information in other affections besides those directly

associated with the urinary organs, and in the succeeding remarks it is proposed to give a concise outline of the mode in which the clinical investigation of this excretion must be conducted, much of which has been condensed from Dr. William Roberts's most valuable work. It need scarcely be remarked that a previous knowledge is requisite of the characters of the urine in health, as well as of its chemical composition, with the average proportion of its chief constituents, and the main physiological variations to which they are liable; the changes which the urine undergoes on standing after its discharge must also be remembered.

1. General Examination.

The first thing to be done with any specimen of urine is to observe its *physical characters*, including colour and general aspect; degree of clearness or turbidity; consistence; characters of the froth on shaking; odour; specific gravity; and presence or absence of any deposit. It is often of much importance to measure the quantity passed in the twenty-four hours, and when taking the specific gravity or making quantitative analyses, a specimen from a mixture of the whole of this urine should be employed. Then the *reaction* should be taken, this being done as soon as possible after the urine has been passed, by means of turmeric, and blue, green, or violet-tinted litmus papers. Should the urine be alkaline, it is requisite to determine whether this is due to fixed alkali or to ammonia, which is proved by drying the test-paper in the open air, when, if the alkalinity depends on ammonia, this evaporates and the paper is restored to its original colour. Further, it is very important, should the urine be ammoniacal, to ascertain whether it is discharged in this condition, or if the presence of ammonia results from subsequent decomposition, and how soon this substance is produced. The specific gravity is ascertained by means of the *urinometer*, care being taken that the instrument does not touch the sides or bottom of the glass containing the urine; and that the number on the stem which represents the density is read off by looking at it on a level with the surface of the liquid.

2. Chemical Examination.

This is carried out with a view of determining:—*a.* The presence and proportion of certain *normal constituents* of urine, especially urea, uric acid, hippuric acid, chlorides, phosphates, and sulphates. *b.* The presence and quantity of *abnormal organic ingredients*, chiefly bile, albumen, sugar, pus, and fat. *c.* The nature of any *deposit*. *d.* The existence of various substances *introduced into the body from without*, such as lead or arsenic. It is desirable to point out the tests employed for the most important of these materials.

1. UREA.—The **qualitative** test for urea consists in adding pure nitric acid to some urine carefully concentrated by evaporation in a water-bath, when a crystalline precipitate of nitrate of urea is thrown down, the crystals of which appear under the microscope as flat

rhombic or hexagonal plates. **Quantitative estimation.**—An approximate knowledge of the amount of urea excreted daily, sufficient for ordinary clinical purposes, is obtained by collecting the whole of the urine passed in the 24 hours, and taking the specific gravity of a mixed specimen, provided it does not contain sugar or albumen. A table has been drawn up by Professor Haughton showing the relations between the quantity of urine, its specific gravity, and the amount of urea. For accurate determination the *volumetric method* of Liebig is that generally employed. It depends upon the fact that urea forms with mercuric nitrate a precipitate of definite composition. For this process three solutions are required, viz., 1. One consisting of a volume of cold saturated solution of barytic nitrate with two volumes of saturated baryta-water. 2. A standard solution of mercuric nitrate. 3. A solution of carbonate of soda, about gr. xx to 3i. A measured quantity of the urine is first mixed with half its bulk of the baryta solution, in order to precipitate the sulphates and phosphates, which are then separated by filtration, a drop or two of the filtrate being further tested in order to see that these ingredients are entirely removed, and if they are not, more baryta solution must be added. A certain quantity of the filtrate is then taken, and the mercurial solution very cautiously dropped into it from a graduated burette, until it begins to become turbid, the amount required to produce this effect being noted down. No precipitate falls until all the chloride of sodium present has been decomposed, and the quantity required for this purpose must be subtracted in the subsequent calculations from the total volume added. As soon as a precipitate forms, the mercurial solution is to be allowed to flow in freely at first, and afterwards again gradually, the mixture being stirred with a glass rod. In order to ascertain when the whole of the urea has been precipitated, a little of the carbonate of soda solution is placed on a white porcelain surface, and a drop of the precipitated mixture added to it by the aid of a glass rod; as soon as a yellow tinge is thus produced, it indicates that the whole of the urea has been thrown down. The matter then becomes merely one of calculation, the mercurial solution being of such a strength that each cubic centimeter used *after the decomposition of the chlorides* corresponds to 0.01 gramme of urea.

Another mode of estimating urea quantitatively has recently found favour, viz., Davy's method, modified by Dr. Russell and Mr. West; which is founded on the decomposition of urea by the hypobromites, and the liberation of nitrogen. For carrying out this process a special apparatus is required, convenient forms of which have been devised by Mr. Apjohn and Mr. Blackley. A solution is prepared containing 100 grammes of caustic soda and 25 c.c. of bromine in 250 c.c. of water, and the nitrogen which is liberated when a measured quantity of this solution acts upon a certain amount of urine is collected, and the proportion of urea present can be calculated therefrom.

2. **URIC ACID.**—The test for the presence of uric acid is to place a little of the substance supposed to contain it on a porcelain dish; add a little nitric acid; evaporate over a spirit-lamp until a yellowish-red residue is left; and finally touch this when cold with a glass rod

dipped in solution of caustic ammonia. A characteristic bright violet colour is immediately brought out, due to the production of *murexid*. To obtain the acid from urine, it is requisite to add excess of strong hydrochloric or acetic acid to a specimen of this fluid, and to let it stand for 24 hours. The uric acid is then precipitated in a crystalline form, and may be tested as above. This is also the method usually followed for its **quantitative estimation**, though it is not very accurate, a measured quantity of urine being taken, and the precipitate collected on a weighed filter, which is afterwards dried and again weighed.

3. **INORGANIC ACIDS**.—With regard to the inorganic acids, it can only be stated that phosphoric acid is best recognized by the ammonio-magnesian test; hydrochloric acid by argentic nitrate; and sulphuric acid by barytic nitrate. The *quantitative estimation* of these substances presents so many practical difficulties, and their proportion is liable to so many variations from different causes, that its consideration would be quite beyond the province of this work.

4. **ALBUMEN**.—The two most reliable tests for albumen are *heat* and *nitric acid*, by which this material is coagulated and precipitated.

a. The **heat-test** is best performed by placing some urine in a test-tube, and heating its upper portion by means of the spirit-lamp, this being then compared with the lower part, and thus the slightest opalescence can be detected. There are some important precautions to be observed. 1. It is essential to see that the urine is acid, and should it be alkaline a few drops of acetic acid must be added. 2. The portion of urine employed should be quite transparent and clear, and if there is any permanent turbidity, the urine ought to be filtered; when this is due to urates, however, all that is necessary is to pass the tube two or three times along the flame, by which these urates are immediately dissolved, and then the upper part may be further heated. 3. The portion which is being tested must be boiled, because, when the proportion of albumen is small, it is only then that cloudiness is observed. The rapidity of coagulation is in proportion to the quantity of albumen present. 4. After heating, it is well to add a drop or two of nitric acid, because, if the urine is only faintly acid, earthy phosphates may be precipitated and thus give rise to turbidity. These salts, however, are immediately dissolved by the acid.

b. The addition of **nitric acid** to cold urine is, with certain precautions, a very delicate test for albumen. The best plan is to place some urine in a test-tube, incline the latter, and gradually pour strong acid down along its inner surface, so that from its higher specific gravity the acid may sink to the bottom of the tube without mixing. It has also been recommended to put some acid in the tube, and pour the urine upon this. Near the junction of the two liquids more or less turbidity is observed, which gradually spreads upwards through the stratum of urine. The chief fallacies with regard to the nitric acid test are as follows:— 1. If only a very little acid is added to the urine, the albumen may not be precipitated at all; and, on the other hand, if a considerable quantity is suddenly mixed with it, the same result may follow, even though there is much albumen present. 2. Cloudiness may not be observed for two or three minutes if the proportion of albumen is very small,

and therefore the contiguous strata must be watched for this period. 3. If the urine is highly concentrated, the addition of nitric acid is liable to cause precipitation of urates; in this case, however, the cloudiness begins *at the surface* of the urine, and extends downwards, while heat dissolves the precipitate instantly. 4. When there is great excess of urea, nitric acid may cause its precipitation, but this occurs very slowly, and the deposit is crystalline. 5. Opalescence of urine may be due to the patient taking cubebs or copaiba, and this is sometimes increased by adding nitric acid. These ingredients are recognized by their odour; and by the effects of heat, which diminishes the opalescence, and prevents any turbidity with nitric acid.

Quantitative examination.—For ordinary clinical purposes, a sufficiently exact estimation of the amount of albumen present in a specimen of urine may be obtained by adding a little acetic acid to some of this fluid in a test-tube, boiling, and then setting the specimen aside until the coagulated particles have all subsided, when the depth of the deposit can be compared with that of the urine, the proportion being expressed as “almost solid,” $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ th, &c., or as mere “cloudiness” or “a trace.” Sometimes the precipitate from a measured quantity of the urine is collected on a weighed filter, which is then washed, dried, and again weighed.

Another method of estimating the amount of albumen in urine has been introduced by Dr. William Roberts, which he terms the *dilution method*. It consists in diluting the albuminous urine with water, until it gives a faint but distinct reaction with nitric acid in between half and three-quarters of a minute after the contact of the acid. Each dilution with an equal volume of water is counted as a “degree of albumen,” and such degree corresponds to 0.0034 per cent., or 0.0148 grain per fluid ounce; from this the total amount of albumen may be calculated. The operation is a delicate one, and should be performed in daylight.

The effect of albumen on the *polarization of light* has also been made use of to determine its quantity in urine.

Before estimating the amount of urea and other urinary constituents, it is requisite to remove any albumen present, by carefully acidulating with acetic acid, heating *just to the boiling point*, and filtering.

5. SUGAR.—Grape-sugar is the variety met with in urine. It has been stated by many observers to be present in healthy urine, but if such is the case, the proportion of sugar is so minute as to be practically of no consequence from a clinical point of view.

Before proceeding to test for sugar, it is important to ascertain that there is no albumen present in the urine, and should there be any, it must first be got rid of. It has been recommended to filter urine thoroughly through animal charcoal before testing for sugar, and especially before estimating its quantity.

Qualitative tests.—1. **Reduction-test.** This is by far the most reliable, and it depends upon the power which grape-sugar possesses of reducing certain metallic oxides to a lower degree of oxidation, or to the metallic state. A salt of copper is usually employed, cupric oxide being reduced to cuprous oxide, which falls as a precipitate. There are two chief modifications of the test, viz., Trommer's and Fehling's.

a. Trommer's. A drop or two of a weak solution of *cupric sulphate* is added to some of the urine in a test-tube, and then about half its bulk of *liquor potassæ*, care being taken that sufficient of the latter is added to dissolve all the copper-salt. On boiling this mixture, which should be quite clear and free from any precipitate, and of a bluish or bluish-green colour, an orange-red precipitate of cuprous oxide falls, which subsequently changes to reddish-brown. This method is for several reasons unsatisfactory, and Fehling's is much more reliable. *b. Fehling's.* Here a standard solution is made use of, composed of *cupric sulphate* (40 grammes); *potassic tartrate* (160 grammes); *liquor sodæ*, of sp. gr. 1.12 (750 grammes); with *distilled water* to 1154.5 cubic centimetres. This solution is very prone to decompose, racemic acid being produced from the tartaric, which also possesses the power of reducing cupric oxide, and therefore the test-liquid should be always kept in completely-filled and thoroughly-stoppered bottles, in a cool and dark place. The proper mode of using this test-solution is as follows:—A drachm or two is placed in a tube, and heated over the spirit lamp until it boils; if any decomposition has taken place, a precipitate of cuprous oxide will be thrown down in one or two minutes, and should this happen, the test-solution is unsatisfactory, and it is best to prepare a fresh specimen. When the solution is satisfactory, if the urine is supposed to contain a *considerable amount* of sugar, a drop or two of it is to be added while the solution is boiling, when a brick-red precipitate of cuprous oxide falls immediately, and if more urine is added the deposit becomes yellow. Care must be taken under these circumstances not to add too much urine, as great excess of sugar will cause the precipitate to be redissolved, producing a clear yellow solution. If there is only a *small proportion* of sugar present, the urine must be poured in until nearly as much as the quantity of test-solution employed has been added, but on no account must the quantity exceed an equal bulk. This mixture is again to be boiled, when, if a small quantity of sugar is present, it assumes an intense opaque yellowish-green appearance, and slowly a bright yellow deposit subsides. If there is no immediate precipitation, the mixture must be set aside in a warm place to cool gradually, when, if only a very minute proportion of sugar is present; the liquid by degrees loses its transparency, and assumes a light-greenish opacity or milkiness, which is quite characteristic (W. Roberts). It is highly important to avoid boiling for any length of time, as this is quite unnecessary, while uric acid and other urinary constituents have the power of reducing cupric oxide after prolonged boiling.

Dr. Pavy employs a modification of Fehling's solution, which is more stable, and which contains the following ingredients:—*Sulphate of copper*, 320 grains; *potassic tartrate*, 640 grains; *caustic potash*, 1280 grains; *distilled water*, 20 fluid ounces.

2. **Moore's test.**—This test consists in mixing equal quantities of the suspected urine and of *liquor potassæ* in a test-tube, and boiling the upper portion. A change of colour is observed to a more or less deep brown; or, if there is much sugar present, it may even become almost black. This is by no means a reliable test, for it cannot detect small quantities of sugar; while urine which is concentrated and high-

coloured, or which contains excess of phosphates or much albumen, will become darkened on boiling with liquor potassæ, and this is particularly the case with markedly albuminous urine, if the liquor potassæ should have become impregnated with lead from having been kept in glass bottles.

3. Fermentation-test.—A small quantity of German yeast is placed in a test-tube, which is then quite filled with the urine, inverted over a shallow dish or saucer containing some of the same liquid, and set aside in a warm place for some hours. If sugar is present fermentation goes on, and carbonic anhydride is set free and collects at the top of the tube, gradually expelling the urine. The gas may be tested by a lighted taper. This is not a delicate test. Dr. William Roberts makes use of the *loss of specific gravity* in the urine after having undergone this process, both for indicating the presence of sugar and its amount.

4. Hassall's test.—Dr. Hassall considers the growth of the yeast-plant (*torula cerevisiæ*) in urine, visible on microscopic examination, as certain evidence of the presence of sugar. There are several reasons why this test is not very practicable.

Quantitative estimation.—As regards diabetic urine, where a large quantity of sugar is passed daily, the specific gravity will give an approximate idea of the proportion discharged. For accurate analysis, however, the following are the chief methods adopted. **1. Volumetric analysis**—10 c.c. of Fehling's solution are placed in a flask and boiled, and some of the urine, either alone or diluted with a certain proportion of water, according to the amount of sugar present, is added by degrees from a graduated burette, until the blue colour has entirely disappeared, which can be observed by holding the flask between the eye and the light after each addition, allowing it to stand for a minute, so that the sediment may subside. The above amount of the test-solution is decomposed by 1 grain of sugar, and from this the whole quantity of sugar excreted may be determined. **2. Differential-density method.**—The *loss of density* in the urine after fermentation is considered by Dr. William Roberts as giving very accurate information as to the quantity of sugar present. Each degree of density lost corresponds to 1 grain of sugar in every fluid ounce of urine. **3. The polariscope** is sometimes employed to estimate the quantity of sugar, provided the urine is transparent, this being determined by the degree to which the plane of polarization is *rotated to the right*.

6. BILE.—The following are the chief tests which are practised for the detection of bile in the urine :—

1. Gmelin's test.—This is employed for the purpose of indicating the presence of *bile-pigments*. It consists in bringing strong nitric acid into contact with the urine, when, if bile be present, a play of colours is developed, from green to violet, blue, and finally to red, which soon disappears. These changes in colour are due to the gradual oxidation of the urinary pigments. The green colour is the most characteristic, being dependent upon the formation of biliverdin, and it must be remembered that a *reddish tint* is brought out by nitric acid in most specimens of urine, while if much indican is present, a blue or violet or even a green colour may be developed.

This test may be performed either by placing a drop or two of the urine and acid separately on a white porcelain surface, and then causing them to come into contact; or by pouring a little nitric acid into a test-tube, and, holding this in an oblique position, allowing the urine to run gently down its interior, so that it may fall on to the surface of the acid. The succession of colours is observed at the junction of the two liquids. The urine may be placed in the tube first, and the acid poured in gradually, so as to sink to the bottom.

Other oxidizing agents have been employed for the purpose of bringing out the green colour in urine containing bile-pigment. Dr. W. G. Smith has advocated the use of tincture of iodine, one or two drops of which are allowed to trickle down on to the surface of the urine contained in a test-tube.

2. **Pettenkofer's test.**—By this method the *bile-acids* are detected. The test depends upon the development of a deep purple colour when these acids are acted upon by cane-sugar and strong sulphuric acid. This reaction is, however, for several reasons most unreliable when applied to urine, and the bile-acids must be separated from the urine by a complicated process, should it be needful to carry this out.

Ordinarily Pettenkofer's test is practised in one of the following ways:—(a.) Strong sulphuric acid is gradually added to some of the liquid to be examined, contained in a test-tube, until the bile-acids, which are first precipitated, are redissolved. Then a small lump of sugar or a drop of syrup is allowed to fall into the mixture, when a series of colours is observed, from pink to red, and finally to purple. (b.) Mix a drop of concentrated syrup with, or dissolve a fragment of loaf sugar in a little of the fluid placed in a white porcelain dish; then add about an equal volume of sulphuric acid; and finally heat moderately. The change of colour to red, and afterwards to purple, will be developed.

3. Microscopic Examination.

The objects which may be discovered in urine by the aid of the microscope include:—a. *Extraneous materials*, such as fragments of cotton-wool or flax, hairs, woody fibres, starch-granules, or oil-globules. b. *Unorganized particles*, crystalline or amorphous, including chiefly uric acid and urates, oxalate of lime, phosphates, cystine, xanthine, leucine, and tyrosine. c. *Organized bodies*, namely, renal or other epithelium, renal casts, blood-corpuscles, pus-cells, cancer-cells, fragments of hydatids, pigment, fat, spermatozoa, or low vital organisms, including vibriones, mould fungus, torulæ, and sarcinæ. In order to examine urinary deposits microscopically, a quantity of the urine must be set aside in a conical or cylindrical glass, the supernatant fluid being poured off after standing for two or three hours, and a drop of the sediment then placed on a glass slide, or this may be taken up by means of the pipette. Not uncommonly the microscope is also employed to examine deposits formed during chemical reactions; and, on the other hand, the effects of chemical reagents on objects observed under the microscope sometimes give valuable information.

4. Examination of Urinary Deposits.

It will be expedient now to consider deposits in urine separately, and to describe the chief characters by which those ordinarily met with are recognized. In examining such deposits, certain *general characters* must first be noticed, viz., their amount; colour and general aspect; mode of aggregation and deposition, whether amorphous, crystalline, or flocculent; and their apparent density and manner of precipitation, which may be observed by shaking up some of the specimen, and then allowing it to stand. Next they must be submitted to the action of *heat*; of *nitric* and *acetic acids*; and of *liquor potassæ*, in order to test whether they are soluble by these agents. Finally some of the sediment must be examined *microscopically*. The principal urinary deposits, with their main characters, are as follows:—

1. **Uric acid.**—Urine which deposits this substance is always very acid. Generally the uric acid is mixed with urates, and forms some time after the discharge of the urine. To the naked eye it is presented as more or less brown or brownish-red crystals, either forming a superficial film, adhering to the sides of the vessel, or falling as a heavy reddish deposit. The crystals are not soluble by heat or dilute acids, but they are dissolved by strong alkalis. Chemically they may be recognized by the *muræxid-test*. Microscopically they are distinguished by their *colour* and *form*, the latter being primarily that of a rhombic prism or lozenge with pointed ends, but the crystals present numerous diversities in shape, becoming ovoid or oval tablets, barrel-shaped, quadrangular, cubes, hexagonal, rod-like, stellate, rosette-like, &c. If a drop of *liquor potassæ* is added, they are dissolved at once, but may be re-precipitated as hexagonal plates by adding a drop of *acetic acid*.

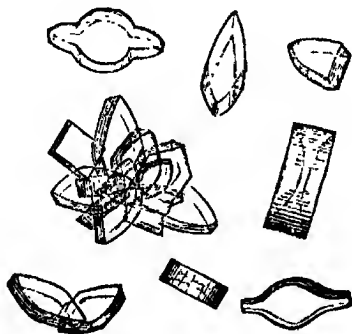


FIG. 21.*

2. **Urates.**—These are very common urinary deposits, even in health. As a rule they appear as *amorphous urates*, which consist of the salts of potash, soda, ammonia, and lime, in variable proportions. The conditions favourable to their deposit are a high specific gravity, and very acid reaction of the urine; and a low temperature of the air. They form more or less speedily after the discharge of the urine. The precipitate is quite amorphous, pulverulent, and loose; sinks with tolerable rapidity; and presents a variable colour, such as milky, fawn, orange, pink, deep-red, or purplish, owing to the urates carrying down the urinary pigments. A film forms on the surface and sides of the containing glass. *Heat* dissolves the precipitate very speedily and completely, and *liquor potassæ* produces the same effect. Microscopically it appears as minute amorphous granules, of variable size, and more or less dark and opaque.

* Uric acid crystals.

(Fig. 22, *a*.) Urates of soda and ammonia are occasionally deposited in a *crystalline* form, the former as a whitish or yellowish sediment which sinks rapidly, and usually forms in the bladder; the latter generally as a dense white precipitate, in urine which has decomposed and become strongly ammoniacal. They appear under the microscope as

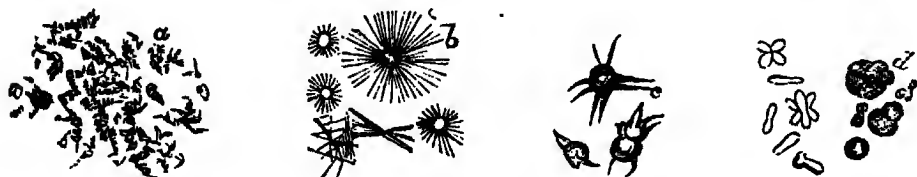


FIG. 22.*

globular, dark, opaque particles, from which project spiny crystals, straight or curved. (Fig. 22, *c*.) Urate of ammonia also occurs in the form of minute dumb-bells. (Fig. 22, *d*.)

3. **Oxalate of lime.**—This forms but a very slight, colourless deposit, usually in highly-coloured and acid urine. It crystallizes in fine lines on the interior of the containing glass, while the sediment is described by Dr. William Roberts as consisting of two parts—a soft, pale-grey, mucus-like portion at the bottom; and overlying this a snow-white, denser layer, with an undulating but sharply-limited surface. Oxalate of lime is not dissolved by *heat*, *acetic acid*, or *liquor potassæ*; but is speedily soluble in *mineral acids*. It crystallizes either in the form of minute octahedra, very short in one axis, or of pyramids; or as biconcave, circular or oval discs, with rounded margins. Under the

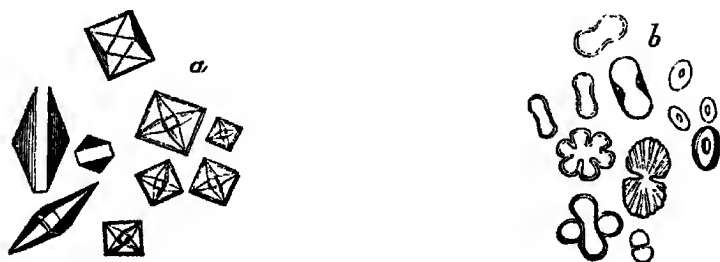


FIG. 23.†

microscope the former vary in appearance according to their position, but commonly they present a characteristic envelope-like appearance, exhibiting a square surface crossed diagonally by two lines. (Fig. 23, *a*.) The latter are presented as dumb-bells, or as ovoids and circles. (Fig. 23, *b*.)

3. **Phosphates.**—These are deposited in alkaline urine as a rule, but

* Fig. 22.—*a*. Amorphous urates. *b*. Crystals of urate of soda. *c*. Hedgehog crystals of urate of soda. *d*. Urate of ammonia.

† Fig. 23.—Oxalate of lime.—*a*. Octahedra and pyramids. *b*. Dumb-bells and ovoids.

occasionally in that which is neutral or faintly acid. They are not dissolved by boiling, which even increases the precipitate, giving rise to turbidity, and causing the phosphates to fall in flakes. A drop of *nitric acid* dissolves them instantly. Three varieties of phosphates are met with as urinary deposits:—*a. Amorphous phosphate of lime—Bone-earth.* This occurs as a whitish, light, flocculent sediment; accompanied with a superficial iridescent film. Microscopically it presents irregular groups or patches of minute pale granules. *b. Crystallized phosphate of lime—Stellar phosphate.* Of rare occurrence, the crystals assume very various forms, but most of them resemble crystalline rods or needles, either distinct or grouped in various ways. (Fig. 24, *a*.) *c. Phosphate of ammonia and magnesia—Triple phosphate.* This is the most common form of phosphatic deposit, being generally

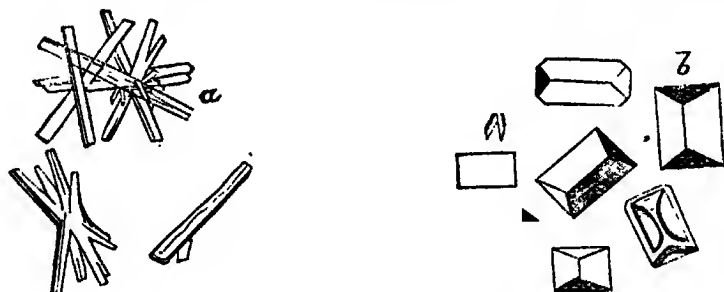


FIG. 24.*

mixed with the amorphous phosphate. The precipitate is quite white; while brilliant colourless crystals are seen forming a film on the surface of the urine, and studding the sides of the glass. Under the microscope the crystals are usually very characteristic, appearing as triangular prisms with bevelled ends, but the primary form is liable to numerous variations. (Fig. 24, *b*.)

5. **Carbonate of lime** occasionally falls as an amorphous deposit, along with phosphates; and it is said to be now and then presented in the form of crystals.

6. **Cystine.**—The urine in which this rare substance is found is turbid on being passed, of a yellowish-green colour, having an oily aspect, and a peculiar odour like sweet-briar. It is faintly acid, but very prone to decomposition, becoming green and evolving hydric sulphide. The deposit which forms on standing appears to be abundant and light, but it weighs very little. This deposit is not dissolved by *heat* or *acetic acid*, the latter, on the contrary, causing increased precipitation; but it is soluble in *mineral acids* and *caustic ammonia*, being deposited from the latter solution after spontaneous evaporation. Microscopically the crystals appear as brilliant, colourless, hexagonal

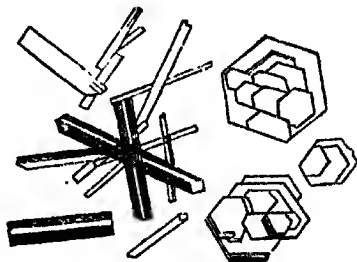


FIG. 25.†

* Fig. 24.—*a*. Stellar phosphates. *b*. Triple phosphates. † Fig. 25.—Cystine.

tablets, having a pearly lustre, often overlapping each other, or being arranged in the form of rosettes. Cystine also crystallizes in square prisms. (Fig. 25.)

7. **Leucine—Tyrosine.**—These are stated to form a greenish-yellow sediment, tyrosine appearing under the microscope as delicate needles, grouped in globular masses or bundles; leucine as dark globules, resembling those of fat.

8. **Fat.**—The chief condition in which a deposit of fat is observed is in the so-called *chylous urine*. It causes the liquid to assume a whitish, opaque, and milky aspect, which disappears on the addition of *ether*, the urine then becoming transparent and clear. On standing the fat collects on the surface as a creamy layer. Under the microscope it appears in the form of extremely fine molecules.

The material named *kisteine* may also be alluded to here. This is a peculiar whitish pellicle, which sometimes forms on the surface of urine after it has stood for a few days, and formerly supposed to be a characteristic sign of pregnancy, but-it is now known that such is not the case. It consists of abundant fat globules, crystals of phosphates, and the mould-fungus.

9. **Mucus and Epithelium.**—All urines contain a small quantity of these elements, the epithelium being shed from the genito-urinary passages. A light cloud subsides on standing, and the cells may be seen on microscopic examination, differing in character according to the part whence they are derived. In some cases mucus is present in considerable quantity. It does not become ropy on adding *liquor potassæ*.



FIG. 26.*

In connection with certain diseased conditions, the epithelium of the bladder, ureters, pelvis of the kidney, or of the renal tubules may be present in the urine. The *extra-renal* cells (Fig. 26, *b*) present such varied and curious shapes, that they have been mistaken for cancer-cells. *Renal* epithelium-cells (Fig. 26, *c*) may be separate or in patches, and healthy in appearance, atrophied, granular, fatty, or entirely disintegrated. Usually they are associated with *casts*.

10. **Pus.**—If pus is present in any quantity, the urine containing it is turbid on being passed, and does not become clear when boiled. A

* Fig. 26.—*a*. Vaginal epithelium. *b*. Epithelium from the bladder, ureter, and pelvis of the kidney. *c*. Renal epithelium, healthy and fatty.

yellowish-white sediment forms; and if the urine is ammoniacal, or if solution of *potash* or *ammonia* be added, the pus assumes the characters of a ropy, viscid, tenacious material, which can be drawn out into strings. There is necessarily some albumen present, but it is never abundant when due to pus alone. Under the microscope pus-cells (Fig. 27) are visible, but they are frequently much altered in their characters in decomposed urine.

11. **Blood.**—Urine containing only a little blood may not give any indication of its presence to the naked eye, but it often presents a characteristic smoky appearance; when more abundant, the fluid has a more or less deep pink or red colour, until in extreme cases it may look almost like pure blood. Sometimes the blood is separate from the general mass of urine, and it may be in distinct coagula, or these may form on standing. A brownish, grumous, flocculent deposit falls after a time. The urine is necessarily albuminous. Red corpuscles (Fig. 28) are visible on microscopic examination, but if the urine is very dilute, they are liable to be distended and thus to lose their normal characters; or, if it is ammoniacal, they speedily alter in shape, and may even break up. Minute vermiform coagula or casts may also be seen under the microscope. In certain conditions the urine contains more or less of the colouring matter of the blood, with albumen, but without corpuscles or fibrin.



FIG. 27.*

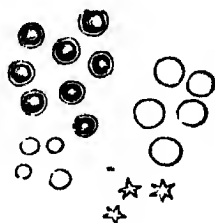


FIG. 28.†

12. **Renal casts.**—In certain morbid conditions of the kidneys minute moulds form in the renal tubules, technically termed *casts*. Their origin in the kidney has been disputed, but of this there can be no doubt, as they have been seen in the convoluted and the straight tubules. These casts are washed away by the urine, in their course outwards being broken up into smaller fragments, and they are visible on microscopic examination, affording information as to the state of the kidneys of the highest importance both for diagnosis and prognosis. As a rule these casts form but a slight cloudy sediment in urine, if any, but sometimes a considerable white deposit falls. Microscopic examination can alone positively reveal the presence of casts, and it is advisable to make a few observations at intervals before coming to any positive conclusion, and also to repeat the examination frequently during the progress of the case. In some instances the examination has to be conducted with the greatest care before casts can be detected, and it may be desirable to introduce a little magenta or carmine staining-fluid beneath the cover-glass; it has also been recommended to add acetic acid to the urine, in order to precipitate uric acid, which will carry down the casts along with it.

Renal casts are generally cylindrical, often bent to a certain degree, and they vary in diameter usually from $\frac{1}{1000}$ to $\frac{1}{500}$ of an inch. Occasionally a minute cast seems to be imbedded in a larger one. Care

* Fig. 27.—Pus-cells in urine, unaltered, and affected by acetic acid.

† Fig. 28.—Blood-corpuscles in urine.

must be taken not to mistake shreds of mucus, or other microscopic objects for casts. Certain varieties are met with, but they all consist of a more or less solid basis, in most cases associated with microscopic elements which characterize the several forms. The basis, which is usually transparent or very faintly granular, but occasionally fibrillated, was formerly considered to be coagulated fibrin, derived from blood-plasma of escaped blood, or which had exuded through the walls of the vessels. Undoubtedly it is in many instances of this nature, but in others it has a different origin and composition, but observers are by no means agreed on this matter. Thus it has been supposed that the material is sometimes inspissated albumen, but on no sufficient grounds. The view most in favour at present is that it is derived in some way from the renal epithelium-cells. Thus it has been attributed to colloid degeneration of these cells; to a substance secreted by them; or to the material which in health forms the substance of the epithelial cells. In disease this substance, perhaps somewhat altered or not perfectly formed, collects in the tubes and becomes inspissated (Beale).

The chief recognized varieties of casts are as follows, two or more

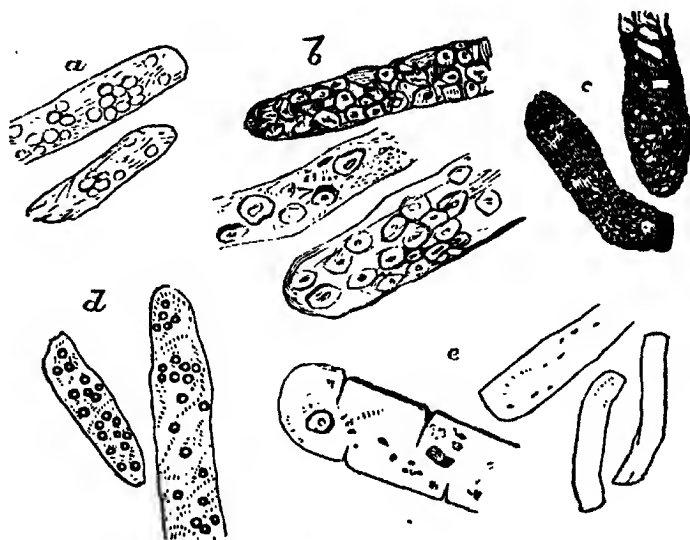


FIG. 29.*

kinds being commonly observed together :—*a. Blood-casts* (Fig. 29, *a*), consisting either of accumulations of blood-corpuscles; or of fibrinous casts studded with these elements. *b. Epithelial casts* (Fig. 29, *b*), usually of some size, and presenting renal epithelium-cells on the surface or imbedded in their substance, frequently somewhat changed from their normal condition. *c. Granular casts* (Fig. 29, *c*), usually of moderate size, and characterized by being more or less granular and opaque in appearance, the granules being either coarse or fine, and

* Fig. 29.—*a.* Blood-casts. *b.* Epithelial casts. *c.* Granular casts. *d.* Fatty casts. *e.* Hyaline casts.

consisting of protein or fat; these are generally mixed to a variable degree with other elements, such as altered epithelium or crystals of oxalates; and also with free granules. On the addition of acetic acid to the specimen under the microscope, if the granules consist of protein they disappear, if they are of a fatty nature they become more evident. Granular casts are divided by some authorities into *large* and *small*. *d. Fatty casts* (Fig. 29, *d*), which exhibit scattered oil globules; or collections of these in the form of dark, botryoidal masses. *e. Hyaline, transparent, or waxy casts* (Fig. 29, *e*), varying considerably in diameter, and therefore divided into *large* and *small*. These have either a perfectly clear, transparent, and glassy aspect; or present faint markings on the surface, or a dimly molecular appearance. Sometimes a few nuclei or epithelium scales are visible upon the hyaline casts. In some cases they can only be seen after the addition of *iodine* or *magenta solution*. *f. Pus-casts*, composed of moulded accumulations of pus-corpuscles, which are extremely rare.

It is in connection with certain forms of *Bright's disease of the kidneys* that casts are of so much importance, and valuable diagnostic conclusions may be arrived at as a general rule from studying their characters. 1. If they consist chiefly of the *blood* or *epithelial* varieties, they indicate an early stage of disease, and the condition of the renal epithelium may be gathered from the characters of the cells on the casts. 2. *Fine hyaline casts* are supposed to come from tubules still covered with epithelium, and when they follow the varieties just mentioned, they show that the disease is subsiding. 3. *Large hyaline casts* are believed to be formed in tubules deprived of their epithelium, and therefore to indicate grave organic changes in the kidneys. 4. Abundant *granular casts* also point to advanced disease, and they are frequently mixed with free granules. 5. *Fatty casts* are of very serious import, as proving the existence of fatty degeneration, with destruction of the renal epithelium.

II. Renal Tumour.

A tumour connected with the kidney has the following general characters:—1. It is *extra-pelvic*, occupying mainly one or other *lumbar region*, and it cannot be separated from the mass of muscles behind. It, however, increases in a forward direction to a variable degree, sometimes attaining an enormous size, and giving rise to general enlargement of the abdomen. 2. The *shape* is generally more or less that of the kidney, the borders being rounded, but irregularity is not unfrequently observed in this respect. 3. As a rule the *consistence* is firm; occasionally there is a feeling of softness, or even distinct fluctuation may be detected. 4. The tumour is almost or quite *fixed*, not being altered by manipulation or by respiratory movements. 5. *Percussion* reveals dulness extending back to the spine, with tympanitic note in front, unless the tumour becomes extremely large. 6. In some cases it may be advisable to use the *aspirateur* or *exploratory trochar* in the diagnosis of renal tumour.

It will be convenient in this connection to allude to certain

peculiarities observed in rare instances in the *position* and *shape* of the kidneys, which may give rise to forms of abdominal tumour.

1. **Movable or floating kidney.** Normally the kidneys are nearly fixed, but occasionally one or both, especially the right, are displaced and become more or less freely mobile, floating about in the cavity of the abdomen. This condition has been by far most frequently observed in females, chiefly after repeated or difficult parturition. It has also been attributed to congenital looseness of the attachments of the kidney; sudden or repeated violent effort; pressure by tight-lacing; rapid absorption of the renal investing adipose tissue in fat people; increase of weight of the kidney during the menstrual periods, resulting from congestion, with a consequent tendency to gravitation downwards; or to this organ being dragged down by a hernia. The movable kidney is felt as a tumour, having the exact form and feel of the healthy organ; and usually lying, when the patient stands erect, in an oblique position, directed upwards and outwards, about midway between the margin of the thorax and the umbilicus. It is mobile in different directions by change of posture, manipulation, and respiratory movements. In some cases the organ may be grasped in the hand, this causing the patient to experience a peculiar sickening sensation. Percussion generally yields a muffled tympanitic sound. On examining the corresponding lumbar region, it will be found flattened or depressed, as well as tympanitic on percussion, owing to the absence of the kidney. In some instances the displaced organ becomes enlarged and painful from time to time, this event being attributed to pressure on its own duct, leading to retention of urine and consequent inflammation. As a result of repeated attacks of this kind the kidney may become permanently fixed by adhesions. Among the most frequent *symptoms* accompanying the floating kidney are mentioned a sense of uneasiness or dragging pain, increased by walking or standing; neuralgic pains; disturbances of the alimentary canal; and other disorders due to compression or irritation. The urine is generally normal, but micturition may be frequent or painful. During the inflammatory attacks severe symptoms may be experienced.

2. Now and then the kidney is fixed in some **abnormal position**, this condition being either *congenital* or *acquired*. The displaced organ is recognized by presenting the characters of the normal kidney, though the shape is usually somewhat altered; and by the signs of its absence from its proper situation.

3. **Horse-shoe kidney.** In this condition the two organs are united by an isthmus passing across between their lower ends. The horse-shoe kidney might possibly be felt in very thin persons with loose abdominal walls, and might thus be mistaken for a tumour. I have never met with it, except at *post-mortem* examinations.

III. DISTENDED BLADDER.

A distended bladder is liable to be met with in medical practice, and it may simulate a tumour or general enlargement of the abdomen. Its characters are as follows:—1. It occupies mainly the *hypogastrium*,

extending upwards and laterally to a variable extent, and being quite symmetrical. 2. The *shape* is conical, the apex being directed upwards. 3. *Fluctuation* is usually perceptible. 4. There is *dulness* corresponding to the enlargement in position and shape; while laterally and at the upper part of the abdomen tympanitic sound can be elicited. 5. By examination *per rectum* the distended bladder may be felt. 6. The use of the *catheter* must never be forgotten; or, if this cannot be passed, a small *trochar* or the *aspirateur* may be inserted above the pubes.

CHAPTER XXXIX.

ON CERTAIN ABNORMAL CONDITIONS OF THE URINE.

I. ALBUMINURIA.

ÆTIOLOGY.—The chief causes of albuminuria are:—1. *Admixture of certain materials which contain albumen*, namely, blood or some of its elements; chyle or lymph; pus from any source; or semen. 2. *Renal congestion*, particularly mechanical hyperæmia due to obstructive cardiac diseases, to chronic lung-affections, or to pressure upon the renal veins or the inferior vena cava by a tumour, a pregnant uterus, or a collection of fluid. 3. *Acute febrile and inflammatory diseases*, e.g., the exanthemata, cholera, diphtheria, pyæmia, ague, pneumonia, serous inflammations, rheumatic fever; and the pyrexial condition which arises in the course of chronic diseases, such as phthisis. 4. Certain affections attended with *an unhealthy state of the blood*, and *relaxation of the tissues*, such as purpura and scurvy; these conditions being also supposed partly to account for the occurrence of albuminuria in pregnancy. 5. *Acute and chronic Bright's disease*, the albuminuria being then mainly due to organic changes in the kidneys. 6. *Chronic lead-poisoning*; and likewise poisoning by inhalation of *arseniretted hydrogen* or *carbonic anhydride*. 7. The use of a *highly-albuminous diet*, especially of abundance of eggs; as well as some forms of *dyspepsia*. 8. *Cold bathing* in some cases. Albuminuria from the causes last mentioned is, however, only slight and temporary. Dr. Bence-Jones has described a peculiar form of albuminuria in connection with osteo-malacia.

SYMPTOMS AND DIAGNOSIS.—The local symptoms, as well as the characters of the urine in cases of albuminuria, will depend upon its cause, and they present considerable diversity. The presence of albumen is determined by the tests already described, its amount being very variable. The kind of *albumen* also differs, it being usually that derived from the serum of the blood; but when the condition is due to errors in diet or deranged digestion, it is of the nature of egg-albumen. Other special varieties are found in exceptional instances, such as that described by Dr. Bence-Jones. The drain of albumen from the blood may itself cause serious disorder of the general system, such as anæmia and its consequences, wasting, debility, and ultimate fatty

degeneration of structures. The *diagnosis* of the *cause* of albuminuria must be determined by the general history of the case ; the characters of the urine ; the accompanying general and local symptoms ; and the condition of the several organs. It is important to recognize the fact that considerable variations in the degree of albuminuria may be observed in the same case at different times, and under different conditions, it being sometimes intermittent ; and that this symptom may be entirely absent in grave forms of renal disease.

TREATMENT.—Albuminuria does not usually call for any direct treatment, and the chief measures to be adopted are those which have for their object the prevention or removal of the cause of the morbid condition, if this is practicable, such as regulation of diet, improvement of the renal circulation, or the cure of any organic disease. Medicines are sometimes employed with the view of checking the escape of albumen, of which the principal are tincture of iron, tannic or gallic acid, mineral acids, alum, and iodide of potassium. It is very questionable, however, whether either of these drugs is really useful for this purpose. The effect upon the system of the loss of albumen may be made up for in some cases by nutritious food, and the administration of iron.

II. PYURIA.

ÆTIOLOGY.—The sources of pus in the urine are :—1. *Abscess in the kidney.* 2. *Pyelitis.* 3. *Cystitis.* 4. *Urethral inflammation*, especially *gonorrhœa.* 5. *Leucorrhœa* in females. 6. The rupture of any *neighbouring abscess* into the urinary passages.

SYMPTOMS AND DIAGNOSIS.—Pyuria is determined by the general characters of the urine ; by chemical examination, which reveals the presence of albumen, and the peculiar ropiness with alkalis ; and by microscopic investigation, when the pus-corpuscles or, rarely, pus-casts may be visible. The amount of pus discharged varies considerably. The urine may be highly offensive. With regard to *diagnosis*, one of the chief difficulties is to determine whether pyuria results from pyelitis, or from chronic inflammation of the bladder and lower urinary passages, especially when these conditions are associated together. The presence of epithelium-cells from the pelvis and infundibula of the kidneys is very important at an early period in revealing pyelitis, but these elements disappear in course of time ; if the complaint exists alone, however, the local symptoms, and the discharge of acid urine containing much pus, especially if combined with a history of some obvious cause of pyelitis, are sufficiently distinctive. When pus comes from the bladder, it is frequently ropy and tenacious, on account of the urine being ammoniacal ; while it is also discharged mainly towards the end of the act of micturition. When disease of the lower passages and bladder has been in existence for a length of time, it is highly probable that the kidneys are likewise involved. When pus originates in urethral inflammation, there are the local signs of this condition ; while pus escapes before the urine, and can be pressed out independently. In doubtful cases where there is leucorrhœa, it has been recommended to

pass a catheter, and thus to remove some of the urine directly from the bladder for examination.

TREATMENT.—Should pyuria require special treatment, the principles are :—1. To remove any obvious cause of the suppuration, if possible. 2. To administer remedies to check the formation of pus, the chief being alum ; astringent preparations of iron ; mineral acids ; tannic or gallic acid ; vegetable astringents, particularly decoction of uva ursi or buchu ; metallic astringents in obstinate cases ; balsams and resins, especially balsam copaibæ ; and turpentine. If the bladder is affected, injections of warm water are useful ; or even astringent injections might be carefully employed. 3. To support the general health ; and to treat the constitutional state by good diet, change of air, sea-bathing, tonics, and cod-liver oil.

III. CHYLOUS URINE—CHYLURIA.

SYMPTOMS.—This is a peculiar condition, in which the urine generally presents a whitish, opaque, and milky aspect, but occasionally it is somewhat bloody. It contains albumen, fibrin, and fat in variable proportions. When the urine is allowed to stand, a soft coagulum forms, while the fat collects on the surface as a creamy layer. The microscope reveals, in addition to fat-molecules, granular nucleated corpuscles resembling chyle-corpuscles. Frequently considerable emaciation and debility accompany chyluria, but these symptoms are by no means constant. The condition may only be present at intervals, of variable duration ; or it may be completely cured.

Drs. Lewis and Cunningham have discovered a minute nematoid worm, to which they have attributed chyluria, named the *Filaria sanguinis hominis* ; numbers of these are found in the urine, and they have also been seen in the blood. The condition is chiefly met with in tropical climates, in some countries being endemic. The adventitious elements in the urine are generally supposed to be derived from the blood in the kidneys ; but Dr. William Roberts believes that they come directly from the absorbent vessels. He remarks :—“ It may be supposed that aggregations of these little animals (*Filaria*) in the kidneys, or some part of the urinary tract, give rise to rupture of the lymphatics and a leakage of their contents into the urinary channels, and in this way produce chyluria.” It is not by any means certain, however, that chyluria is connected with *Filaria*, and some observers have attributed the condition to mere dilatation and consequent rupture of the lymphatics.

TREATMENT.—Medicines seem to have but little effect on chyluria, but the complaint is sometimes cured spontaneously. The chief drugs which have been employed or recommended in its treatment are tincture of iron ; astringents, especially large doses of gallic acid ; and large doses of iodide of potassium. Dr. William Roberts quotes a case which was benefited by decoction of mangrove bark. Salt-water baths may be used, and it seems best to restrict animal diet.

IV. HÆMATURIA.

ÆTIOLOGY.—The blood in hæmaturia may come from the kidneys; from their pelves or infundibula, or the ureters; from the bladder; from the urethra; or, in females, it may be connected with uterine or vaginal hæmorrhage, including ordinary menstruation. Excluding the latter, the causes of hæmaturia may be arranged thus:—1. *Traumatic*, e.g., external injury affecting any part of the urinary apparatus; severe exertion and straining; injury by instruments; and laceration of the mucous membrane of the pelvis of the kidney, ureter, bladder, or urethra by a calculus. 2. *Renal affections*, viz., congestion, including the active hyperæmia induced by certain articles, especially turpentine and cantharides; acute Bright's disease; suppurative nephritis; cancer; tubercle; renal embolism; minute calculi in the tubules; hydatids and other parasites. 3. *Affections of either pelvis or ureter*, viz., cancer, tubercle, and parasitic diseases. 4. *Affections of the bladder*, including congestion; acute cystitis; cancer, especially if of a villous and fungous nature; and varicose veins. 5. *Gonorrhœa* and other *urethral inflammations*. 6. *Endemic*. This calls for special notice, being a form of hæmaturia observed in certain hot climates, especially the Mauritius, which has now been proved to be due to a small parasite—*Bilharzia hæmatobia*—affecting the mucous membrane of the pelvis of the kidney and of the bladder. 7. *Abnormal conditions of the blood*, particularly in connection with purpura and scurvy; but also in malignant fevers, cholera, and other affections. 8. *Vicarious*, chiefly of the menstrual discharge. 9. *Mental emotion* in rare instances, it is said.

SYMPTOMS AND DIAGNOSIS.—For purposes of diagnosis it is highly important to notice whether blood present in urine is passed constantly, or only at intervals, or under particular circumstances, as after riding, jolting, or taking certain articles of food; the mode of its discharge, whether before or after the urine, or along with it, and also if it escapes independently of micturition; its amount; and the degree in which the urine and blood are mingled, whether they are intimately mixed, or more or less separate, or if the blood forms distinct coagula.

The characters of hæmaturia associated with most of the local lesions mentioned above will be hereafter pointed out. At present all that need be said is, that in *renal* hæmaturia the blood and urine are intimately mixed, the colour being frequently smoky, while under the microscope minute moulded coagula or casts are usually visible, being in some cases numerous and decolorized, and accompanied with other renal structures; in bleeding from the *pelvis* or *ureter* there is also an intimate admixture, and moulded vermiform coagula of considerable length may be discharged; in *vesical* hæmorrhage the blood is expelled chiefly or only towards the end of the act of micturition; while in the *urethral* variety it may escape or be pressed out independently of micturition, and when urine is passed, blood precedes it or colours the first portion, and then the urine may become quite clear, blood again appearing at the close of the act. It may, however, flow back into

the bladder from the urethra, thus colouring the urine contained in this organ. Blood is sometimes purposely mixed with urine by hysterical patients and malingerers.

The *diagnosis* of hæmaturia may be further aided by a consideration of the history of the case, and of the previous symptoms, which might reveal some cause, such as a calculus; the seat of local urinary symptoms, whether pointing to the kidney, bladder, or urethra; the results of thorough *physical examination*; and the general symptoms present.

TREATMENT.—This must be conducted on exactly the same principles as are followed in the treatment of other hæmorrhages. The most valuable internal *astringents* in hæmaturia are gallic or tannic acid, acetate of lead, or full doses of dilute sulphuric acid, combined with a little opium. The subcutaneous injection of ergotine deserves trial. The local use of *cold* is also often highly beneficial, in the form of ice applied to the loins, hypogastrium, or perineum, or of cold injections into the bladder; *astringent* injections are also permissible in some forms of vesical hæmorrhage. Dry-cupping over the renal regions is frequently very useful when the blood comes from the kidneys; and occasionally local removal of blood is desirable. Pressure can be applied in the case of urethral hæmorrhage, and for this purpose it may be requisite to pass a catheter or sound. After the occurrence of renal hæmaturia, it is important to watch the case for some time, as coagula may remain in the tubules and thus set up serious mischief.

V. HÆMATINURIA.

ÆTIOLOGY AND PATHOLOGY.—The urine occasionally contains more or less of the colouring matter and albumen of the blood, but no corpuscles or fibrin, and to this condition the term *hæmatinuria* has been applied. This has been observed in connection with septic and malignant fevers; occasionally in purpura and scurvy; after poisoning by arseniuretted hydrogen or carbonic anhydride; and as a distinct affection, named *paroxysmal* or *intermittent hæmatinuria*, which seems to be chiefly caused originally by cold, but has also been attributed to injury over the renal region, and exposure to malaria. Pathologically the condition has been supposed to be due to the red corpuscles of the blood becoming disintegrated and dissolved; or to a nervous disturbance leading to temporary dilatation of the renal vessels, with the consequent escape of some of their contents, without rupture. It is highly probable that in some of the cases described corpuscles have been present in the urine originally, which have subsequently broken down and become dissolved.

SYMPTOMS.—*Intermittent hæmatinuria* comes on in sudden and usually irregular paroxysms, varying much in their frequency in different cases, only occurring during the day, and generally lasting from three to twelve hours; being preceded for a brief period by chills or rigors, languor, a sense of weight or dull pain over the kidneys, pain or stiffness in the legs, occasionally retraction of the testicles, and nausea or vomiting. As a rule there is no pyrexia, and the tempera-

ture falls in some cases below the normal. The urine becomes very dark, resembling porter or port wine; usually turbid; and highly albuminous; while it deposits a chocolate-coloured sediment, which microscopically is seen to consist chiefly of granular matter, sometimes mixed with hæmatine crystals, and often with a few dark granular casts and crystals of oxalate of lime. Spectroscopic examination shows two absorption bands between the orange and green portions of the spectrum, characteristic of the presence of oxy-hæmoglobin, and Drs. Forrest and Finlayson of Glasgow have reported cases in which they noticed in addition "a third, somewhat narrow, absorption band about the middle of the red in the spectrum" which they regard as due to the presence of meta-hæmoglobin, though they are not certain as to the nature of this substance. In the intervals the urine seems to be quite normal; and the change to the healthy condition may be equally sudden with the onset of the paroxysm.

TREATMENT.—Full doses of quinine and iron have been found of most service in the treatment of this complaint.

CHAPTER XL.

URÆMIA—URÆMIC POISONING.

ÆTIOLOGY AND PATHOLOGY.—*Uræmia* is the term applied to a group of symptoms which are liable to occur as the result of grave interference with the urinary functions. The conditions under which they arise may be stated generally as:—1. *Diseases of the kidneys*, especially Bright's disease; or nervous and vascular derangement of these organs, which prevents them from performing their excretory work properly. 2. *Obstruction of both ureters*, so that the urine which is formed cannot escape into the bladder, though it is a remarkable fact that the symptoms are by no means characteristic in these cases. 3. *Retention of the urine in the bladder* from any cause, when the uræmic state is supposed to be partly due to re-absorption of the urinary elements.

Most authorities regard the phenomena of uræmia as due to the accumulation in the blood of poisonous materials, the circulation of which through the nervous and muscular systems occasions the effects characteristic of this condition. Formerly they were attributed to non-excretion of urea, or to the decomposition of this substance, and the consequent formation of carbonate of ammonia; more recent observations, however, seem to indicate that the chief poisonous agents are materials produced as the result of imperfect tissue-metamorphosis, which in the normal course of events should be further converted into urea and uric acid, and then excreted. The watery state of the blood; and œdema with anæmia of the brain substance, have also been made to account for the phenomena of uræmia.

SYMPTOMS.—The clinical phenomena which may be met with indica-

tive of uræmia are headache, sometimes fixed behind the neck or at the back of the orbits, or a sense of weight and pressure over the forehead or vertex; vertigo; increased irritability of the voluntary muscles, evidenced by muscular twitchings or fits of epileptiform convulsions, in the latter the face being pale and the pupils dilated, several fits sometimes occurring in rapid succession, with more or less stupor in the intervals, though consciousness is often partially restored; cerebral disturbance, usually in the direction of drowsiness, heaviness, and confusion of ideas, culminating in stupor or profound coma, delirium being only exceptionally observed; disturbance of vision, in the way of dimness of sight from time to time, or actual temporary blindness, there being no necessary organic changes revealed by the ophthalmoscope; deafness in rare instances; vomiting and diarrhoea, the matters discharged containing a quantity of ammonia, which may be perceptible to the smell; occasionally an urinous or ammoniacal odour of the breath and sweat; and in exceptional cases paroxysms of dyspnoea. The exact combination of symptoms in any individual case varies considerably, as well as the mode and rapidity of their onset. As a rule they come on gradually, beginning with headache and vomiting. Occasionally uræmia is revealed by a perfectly sudden apoplectiform or epileptiform attack; by blindness; or by severe vomiting.

DIAGNOSIS.—Certain cases of uræmia are particularly liable to be mistaken for those of apoplexy, epilepsy, or opium-poisoning. The diagnostic points will be considered in a future chapter; at present I would only draw attention to the great importance of testing the urine in all cases of sudden insensibility. Cases of belladonna-poisoning may also simulate uræmia. The possibility of headache or giddiness, disturbances of sight or hearing, and vomiting or diarrhoea being due to this cause, must not be forgotten.

TREATMENT.—In the uræmic state the main indications are to remove any cause of urinary obstruction; to use measures for promoting excretion of urine, especially free dry-cupping, or the application of heat and moisture over the loins; to encourage the action of the skin by the aid of warm vapour, or hot-air baths; and to treat symptoms. Inhalation of chloroform is useful during the epileptiform attacks. Venesection is often employed for apoplectic seizures, but is not admissible should there be advanced disease of the kidneys. Sinapisms may be applied to the nape of the neck and limbs. Vomiting must be treated in the usual way; but it is not advisable to check diarrhoea too speedily, and a brisk purgative is not unfrequently very serviceable, such as a full dose of jalap and cream of tartar.

CHAPTER XLI.

RENAL CONGESTION—EMBOLISM—INFARCTION.

ÆTIOLOGY.—Congestion of the kidneys may be *active* or *mechanical*. *Active* renal congestion, also named *catarrhal nephritis*, may result from:—1. Any pyrexial condition, but especially that accompanying the exanthemata. 2. Exposure to cold and wet. 3. The use of certain medicines in excess, viz., cantharides, turpentine, nitre, cubebs, or copaiba. 4. Irritating urine in connection with diabetes. 5. Morbid formations in the kidney; or emboli. 6. The early stage of inflammation. 7. It is said hypertrophy of the left ventricle; or, possibly, active dilatation of the vessels, as in cases of hysteria. *Mechanical* hyperæmia is a common consequence of:—1. Some cardiac or pulmonary disease interfering with the general venous circulation. 2. Pressure upon one or both renal veins, or upon the inferior vena cava above their point of junction, by an abdominal tumour or a pregnant uterus.

ANATOMICAL CHARACTERS.—At first the kidneys present the characters ordinarily accompanying congestion, viz., enlargement and increase in weight; increased redness, with points of vascularity, especially corresponding to the Malpighian bodies; and sometimes minute ecchymoses. In many forms of *active* hyperæmia there is a catarrhal state of the ducts of the pyramids, with shedding of their epithelium. After *mechanical* congestion has lasted for some time, the usual pathological changes are set up, leading ultimately to grave disorganization of the kidneys, these organs becoming contracted, indurated, and sometimes granular or irregular, while their cortical substance undergoes more or less atrophy. Microscopic examination reveals alteration in the shape of the tubes, with thickening of their walls; changes in the epithelium, which is often destroyed; increase in the intertubular connective tissue; and permanent distension of the minute vessels. By some authorities this condition is looked upon as a form of Bright's disease.

Emboli not unfrequently lodge in the kidneys, and give rise to *infarctions*, which are almost invariably confined to the cortical portion; differ in size; and are usually well-defined and wedge-shaped, with the base towards the surface. At first they present a dark-red colour, but become decolorized from the centre towards the circumference, leaving yellow masses, which may be ultimately absorbed, depressed cicatrices alone remaining. Rarely an infarction softens and breaks down, forming a pseudo-abscess; or it is said that even actual pus may be produced.

SYMPTOMS.—Congestion of the kidneys is ordinarily indicated by the urine becoming diminished in quantity, high-coloured, and concentrated, and depositing urates abundantly on standing; while it afterwards contains some albumen, occasionally a little blood or clear

fibrinous casts, with a few renal epithelium-cells. In some forms of *active* hyperæmia, however, a copious flow of pale and watery urine takes place, which is of low specific gravity. There may be a sense of fulness about the loins, or even a certain degree of heavy pain, and tenderness is frequently complained of. If the congestion subsides, the urine assumes its normal characters; but if it continues and leads to organic changes in the kidneys, this fluid presents more marked and permanent changes, which will be hereafter considered. As a rule there are no symptoms indicative of *renal embolism*. If the embolus is large, its lodgment may cause a sudden severe pain in the renal region, shooting towards the pelvis; followed by albuminuria or hæmaturia. Should an abscess form in the kidney after embolism, symptoms indicative of this event might set in.

TREATMENT.—If renal congestion calls for any positive interference, the main indication is to remove or mitigate its cause as soon as possible, especially in the *mechanical* form. Rest in the recumbent posture; free dry-cupping, or the application of heat and moisture over the loins, or in some cases the removal of a little blood from this region; the use of the warm bath; and active purgation, are the chief direct remedies to be employed.

CHAPTER XLII.

SUPPURATIVE INFLAMMATION IN CONNECTION WITH THE KIDNEYS.

I. SUPPURATIVE NEPHRITIS—RENAL ABSCESS.

ÆTIOLOGY.—The causes of renal inflammation ending in suppuration are:—1. *Injury* from without. 2. Some *direct irritation* in the substance of the kidney, especially from a calculus. 3. *Suppuration in the bladder or urinary passages*, that in the kidney being set up either by extension or independently, the latter being probably the result of a kind of local pyæmia. 4. *Embolism*. 5. General *pyæmia*. 6. *Extension* of inflammation from surrounding structures.

ANATOMICAL CHARACTERS.—Whatever may be the origin of the inflammation, the alterations in the kidney are in most cases similar at first, viz., enlargement of the organ; hyperæmia, much blood flowing on section; and diminution in consistence. It is supposed that an interstitial exudation then forms. Suppuration usually commences in separate points, which extend and coalesce so as to form one or more abscesses, these varying much in size. In most forms of the disease only one kidney is usually involved, and there is finally but a single abscess, which may attain large dimensions. If not opened, it generally bursts either into the pelvis of the kidney; externally in the loins; into the peritoneum or sub-peritoneal tissue; into the intestines; or into the thorax. Occasionally inspissation of the contents takes place, followed

by caseation and calcification, a cure being thus effected. In pyæmia numerous scattered abscesses of small size are observed. It is said that pus is sometimes infiltrated through the kidneys; and also that it may form within the tubules.

SYMPTOMS.—Acute suppurative nephritis is generally accompanied with local pain in the corresponding lumbar region, often severe, increased by movement, and frequently shooting towards the bladder, testis, or thigh; as well as with tenderness. The testis may be drawn up. The urine is diminished in quantity and concentrated, or even actually suppressed; and it frequently contains some blood or merely a little albumen, but these elements may be quite absent. As a rule distinct rigors usher in the complaint, followed by marked pyrexia, which has a great tendency to assume a typhoid type, especially when suppuration commences, this being accompanied with repeated shiverings. Sympathetic vomiting is not uncommon. Uræmic symptoms are also liable to arise. Should a large abscess form, it presents as an elastic or fluctuating fulness or tumour, usually in the lumbar region, where it may afterwards burst. If it opens into the pelvis of the kidney, a copious discharge of pus takes place along with the urine, and this may afterwards continue either persistently or at intervals. Various symptoms may result from the bursting of a renal abscess into other parts. When the kidneys are involved in pyæmia, there are no prominent local signs; and such is often the case when renal inflammation follows some morbid condition of the urinary passages, when it also frequently runs a somewhat chronic course.

II. PYELITIS—INFLAMMATION OF THE PELVIS OF THE KIDNEY— PYONEPHROSIS.

ÆTIOLOGY.—Pyelitis signifies inflammation involving the mucous lining of the pelvis and infundibula of the kidney. Its important causes are:—1. *Direct irritation* by foreign matters lodged in the renal pelvis, especially a calculus or gravel, parasites, and blood-clots. 2. *Morbid deposits* in the membrane, viz., cancer or tubercle. 3. *Extension* of inflammation from the bladder along the ureter. 4. Irritation by *accumulated urine*, resulting from closure of the ureter owing to pressure or internal obstruction, especially if this urine has become decomposed. 5. In rare instances pyelitis seems to be set up as an *idiopathic* affection, from exposure to cold and wet, or other injurious influences. 6. A certain degree of catarrh of the renal pelvis and infundibula may also arise in the course of other diseases, especially various febrile affections; organic affections of the kidneys, and Diabetes; or from the use of certain *drugs*, such as turpentine or cantharides.

ANATOMICAL CHARACTERS.—Pyelitis may be *acute* or *chronic*, and the appearances vary accordingly. The *acute* form, in which the inflammation is usually *catarrhal*, is characterized by injection of the lining membrane, occasionally with slight ecchymoses or extravasations of blood; relaxation and softening; shedding of epithelium; and the subsequent discharge of a purulent mucus, or of actual pus. Occasionally diphtheritic or croupous inflammation is observed, along with a

similar condition of other mucous surfaces. The *chronic* variety may either follow the acute, or commence independently. The membrane is then pale, though some of its veins may be permanently distended; often grey or slate-coloured from pigment; much thickened; and unusually firm. Pus is constantly formed, and if there is no obstruction it flows away with the urine; should there, however, be an impediment to its escape, the pus accumulates in the pelvis of the kidney, which it distends more and more, giving rise to the condition named *pyonephrosis*; here it is commonly mixed with other materials, such as urine, which is usually decomposed and ammoniacal, deposits or incrustations of uric acid and urates or phosphates, calculi or other materials which have excited the pyelitis, or blood. By degrees the substance of the kidney is compressed and invaded upon, until ultimately the organ may be completely destroyed, a mere sac remaining, containing pus and other matters. In other instances distinct disease is set up in different parts of the kidney—*pyelo-nephritis*; or it may simply shrivel up and become atrophied. The accumulation may burst in any of the directions which renal abscess takes; or occasionally ulceration of the mucous membrane is set up by some foreign body, and perforation occurs before any particular distension of the pelvis is observed. In some cases the pus becomes inspissated, and abundant calcareous deposits are formed, or even imperfect bone, the cavity contracting and shrivelling up.

SYMPTOMS.—In the majority of cases pyelitis is preceded by, or accompanied with, symptoms due to its cause, for instance, those of calculus or disease of the bladder. The *local* clinical phenomena associated with this complaint are uneasiness or pain over one or both lumbar regions, often of an aching character, or shooting downwards; tenderness; a sense of local weakness; generally frequent micturition; changes in the urine; and in some instances the presence of a renal enlargement. The alterations in the urine may be the only deviation from health. This fluid is often increased in quantity; generally acid; and at first contains a little blood intimately mixed with mucus and the variously-shaped epithelium-cells detached from the pelvis and infundibula; gradually it becomes mixed more and more with pus, until finally this morbid product may be present in large quantity, and it comes away persistently so long as no obstruction exists to prevent its escape. Albumen is only observed in proportion to the admixture of blood and pus. Some important differences are noticed in the characters of the urine under certain circumstances. If the flow of pus along the ureter is impeded in any way, as by the lodgment of a calculus, the urine may become quite natural, provided only one kidney is involved; if both are implicated, or if the closure of the ureter is incomplete, the quantity of pus is merely lessened. Should the obstruction be removed, a copious flow of purulent urine again takes place suddenly; this course of events may be repeated from time to time, or the obstruction may remain permanently. Further, if the urine is retained in the renal pelvis, it tends to decompose, and is then frequently discharged in an ammoniacal state. Should the different fluids accumulate here, a fulness or tumour is produced, having the general characters of a renal enlargement, but presenting an elastic or fluctuating feel. This fulness

will increase in size from time to time should the ureter become obstructed, being then also more painful and tender, and it may suddenly subside when the impediment is removed. Occasionally the enlargement attains very large dimensions.

The *general* symptoms are those of pyrexia in the acute form of pyelitis, preceded by rigors. When suppuration is set up, there are commonly repeated rigors, in some cases recurring at regular intervals; and in prolonged cases signs of hectic fever appear. The bowels are often disturbed, there being either diarrhoea or obstinate constipation, the latter resulting from pressure on the colon. If the kidneys become independently implicated, symptoms indicative of Bright's disease set in. In some cases recovery takes place, provided only one kidney is affected, and the cause of the complaint can be removed, though often with complete destruction of the involved organ. Most commonly, however, death ultimately ensues from gradual exhaustion. This event may also result from perforation or rupture of the distended pelvis, the symptoms differing according to the direction in which the opening takes place, and the structure with which the purulent collection communicates.

III. PERINEPHRITIS.

In perinephritis the tissue surrounding the kidney becomes the seat of inflammation, the process usually terminating in suppuration. It may be caused by injury; exposure to cold; or by previous suppurative nephritis or pyelitis. Clinically it presents a history very much like that of the diseases just mentioned, but is distinguished from these affections by the absence of any marked disturbance of the renal functions, or of any changes in the urine. There may also be a greater intensity and superficialness of the pain and tenderness, with more marked exacerbation on movement; and subcutaneous œdema over one lumbar region may be observed. The purulent accumulation generally opens posteriorly, but may rupture in various other directions.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

I. DIAGNOSIS.—The inflammatory affections just described are generally attended with much pain referred to the renal region; functional disturbance of the kidneys, except in the case of perinephritis; and pyrexia. They can in most instances be distinguished by the circumstances under which each occurs; and by the characters of the urine. Acute Bright's disease is diagnosed from these affections by the dropsy and other characteristic symptoms which accompany it; as well as by the condition of urine. In *pyelitis* the presence in the urine of epithelium from the pelvis and infundibula is highly important; while later on pus appears. *Suppurative nephritis* may give rise to the physical signs of an abscess in the renal region. *Perinephritis* is, as a rule, but not invariably, distinguished by the absence of any morbid characters of the urine. *Active renal congestion* might possibly be mistaken at first for some of the inflammatory affections, but the milder character of the

symptoms, and their speedy subsidence, sufficiently characterize this condition. *Acute cystitis* sometimes simulates renal inflammation.

2. PROGNOSIS.—Suppurative inflammatory diseases in connection with the kidney are very dangerous, on account of the interference with the renal functions ; the constitutional disturbance which they occasion, and the dangers incident to the rupture of any purulent accumulation. *Pyelitis* differs much in its gravity according to its duration ; its cause ; and whether it is single or double. When confirmed, this complaint is always serious, but even after complete destruction of the kidney recovery may follow, provided only one organ is involved. Calculous pyelitis is much more favourable than that which follows chronic disease in the lower urinary passages ; or than that which is excited by tubercle or cancer.

3. TREATMENT.—The general measures applicable at the outset in all the forms of acute renal inflammation are to keep the patient in bed, completely at rest ; to cup over the loins to the extent of from 6 to 10 or 12 ounces, if the case is favourable, or otherwise to dry-cup freely ; to apply hot poultices or fomentations constantly over the lumbar region ; to give low diet, with abundance of diluent drinks ; and to act freely upon the bowels. In *suppurative nephritis* or *perinephritis*, should signs of an abscess appear, this should be encouraged towards the surface, and the pus evacuated when the proper time arrives, for which purpose the *aspirateur* is most serviceable. At this time abundant support, along with *stimulants*, may be required, especially if typhoid symptoms should set in. In *pyelitis* it is very important to remove the cause of the disease if possible, and when the complaint is due to a calculus, a considerable amount of opium, or free subcutaneous injection of morphia is often needed, in order to relieve the pain. The measures requisite for the treatment of purulent discharge in the urine have already been considered.

CHAPTER XLIII.

BRIGHT'S DISEASE.

NUMEROUS and diverse have been the classifications adopted by different authors of the morbid conditions included within the term *Bright's disease*. In general language it is employed to signify any structural disease of the kidneys accompanied with albuminuria and dropsy, but these symptoms are not essential. Primarily it is divided into *acute* and *chronic* forms, under which its several varieties may be discussed.

I. ACUTE BRIGHT'S DISEASE.—ACUTE DESQUAMATIVE NEPHRITIS.— ACUTE TUBAL NEPHRITIS.

ÆTIOLOGY.—In the large majority of cases acute Bright's disease is associated with scarlatina ; or results from "taking cold." It may follow

excessive drinking; or is occasionally set up in the course of other exanthemata besides scarlet fever, e.g., measles or typhus fever; in the collapse-stage of cholera; after ague or exposure to malaria, it is affirmed; or during pregnancy. There is good reason for believing that the *pathological* cause in many of these conditions consists in undue exercise of the functions of the kidneys, these organs having to excrete materials which are either formed in excess or of an unusual character, or such as ought to be removed by the skin. The chief *predisposing* causes are the early period of life; want of cleanliness of the skin; intemperate habits; and occupations which involve exposure to wet and cold. In some cases Bright's disease probably exists in a chronic form without giving rise to any evident symptoms, until one of the above causes leads to an acute exacerbation.

ANATOMICAL CHARACTERS.—The kidneys are enlarged and increased in weight, in most cases considerably. At first they are deeply congested, the surface and a section presenting a deep dusky-red colour, with darker spots corresponding to the Malpighian corpuscles or to minute hæmorrhages; while the superficial veins are distended, and a quantity of bloody fluid escapes on section. The surface is quite smooth, and the capsule is easily separated. The enlargement is mainly due to increase in the cortical substance, which is found to be much thickened, softened, lacerable, and friable. The pelves and infundibula are also injected, and a bloody liquid is often found here. In a more advanced stage the colour of the cortical portion changes, becoming either more or less white, yellowish-white, or pale-buff, as well as opaque and dotted, or presenting a mottled surface of red and white; while the pyramids remain dark-red and striated, red lines radiating in a fan-like manner from their bases.

Microscopic examination reveals capillary distension; and the presence of fibrinous exudation within the tubules of the kidney, along with red blood-corpuscles, and extremely abundant epithelium-cells, which become detached, rapidly increase in number, and accumulate in the tubules, many of which appear crammed full of cells, while some of them are dilated. Most of the epithelial particles are altered in their characters, being enlarged; cloudy or opaque; more or less granular from the presence of protein granules or sometimes of fat; or quite disintegrated. Abundant young cells are also present, resulting from proliferation. They accumulate more and more as the disease advances, which mainly accounts for the pale colour, this also partly resulting from compression of the vessels. In some tubules the epithelium may be completely detached, only hyaline fibrinous moulds remaining. These changes are much more evident in the cortical than in the pyramidal portion of the kidneys.

The special characters of the changes in the kidney in connection with scarlatina have already been described, and also the condition named glomerulo-nephritis by Klebs. (See Vol. i., page 141.) Peculiar appearances have been observed in cases of fatal puerperal eclampsia by Dr. Angus Macdonald and Mr. Hamilton, the epithelium-cells being small, and their nuclei abnormally distinct; while many tubes were blocked with a peculiar hyaline or colloid material.

In fatal cases of acute Bright's disease morbid appearances due to

complications are commonly observed, especially serous inflammations; endocarditis; pneumonia or bronchitis. Dropsy and its consequences are also generally present. In some cases the heart is hypertrophied.

PATHOLOGY.—Acute Bright's disease consists essentially in an intense *catarrhal inflammation* of the tubules of the kidney. As a result, in addition to capillary engorgement and rupture, the epithelial cells undergo rapid proliferation. The renal functions are greatly impeded, and hence the blood becomes overloaded with excrementitious matters, as well as unusually watery, and highly deficient in albumen and red corpuscles. The elements formed in the kidneys are washed away by the urine, in which they are visible on microscopic examination.

SYMPTOMS.—As a rule the onset of acute Bright's disease is definite and marked; frequently the complaint sets in with chilliness or rigors, general pains, headache, and nausea or severe vomiting; in other cases dropsy rapidly extending is the earliest symptom observed; and occasionally uræmic phenomena first attract attention. When the disease is established, the characteristic clinical signs include peculiar changes in the urine; more or less general anasarca, frequently accompanied with effusion into serous cavities and œdema of organs; extreme pallor, puffiness, and dryness of the skin; a tendency to uræmia, serous inflammations, endocarditis, pneumonia, or bronchitis; and pyrexia. Generally some degree of dull pain, with tenderness, is experienced over the renal regions, but these sensations are not prominent; micturition also is in most cases too frequent, especially at night, though the quantity of urine passed is greatly diminished, and sometimes this excretion is almost or quite suppressed. The urine which is discharged has the following characters:—it is dark in colour, from excess of pigment, and from the presence of blood, the latter often causing the urine to assume a smoky, brown, or dark-red tint; the specific gravity is high—1025 to 1030, 1040, or more; the reaction is almost always acid; the normal odour is replaced by one compared to that of beef-tea, or to the washings of flesh, or whey; an abundant sediment forms, brown and flocculent; while urates are frequently deposited. Chemical examination reveals abundance of albumen, the urine sometimes becoming almost solid on boiling. The excretion of urea and inorganic salts is greatly diminished, but uric acid is about normal. Under the microscope the deposit is seen to consist of red blood-corpuscles, in some cases much altered in their characters; renal epithelium-cells, usually more or less swollen, cloudy or granular, or partially disintegrated; remnants of these cells, in the form of nuclei or granular matter; extra-renal epithelium; amorphous particles of fibrin; and numerous casts, chiefly of the *blood* and *epithelial* varieties at first, and of medium size, with a few large or small *hyaline*, and some opaque *granular* casts. The casts change during the progress of a case of acute Bright's disease, and it is very important to study these alterations; not uncommonly a little fat appears in connection with these casts and with the epithelium, which disappears as the disease subsides.

Dropsy often comes on with great rapidity, in some cases rendering a patient irre recognizable in a few hours; while the face assumes a characteristic blanched, pasty, and puffy aspect. Hydrothorax, ascites, and œdema of the lungs are common; while œdema glottidis some-

times proves highly dangerous. The patient generally feels dull and heavy, or complains of headache, distinct uræmic symptoms being also liable to supervene at any time. Inflammatory complications will be indicated by their special signs, those chiefly to be borne in mind being pericarditis, pleurisy, peritonitis, endocarditis, bronchitis, and pneumonia. Fever is often high, with a full hard pulse; while there is complete loss of appetite, great thirst, and usually constipation. The blood is hyperinotic.

The late Dr. Sibson (Lumleian Lectures, 1874), has drawn special attention to certain signs in connection with the heart and vessels in cases of Bright's disease, and in the acute form he frequently noticed the following phenomena:—tension and hardness of the radial artery; a second beat over the aorta in the first and second right intercostal spaces; an intensified metallic second sound and muffled first sound over the aorta; reduplication of the first sound, variously distributed, but usually best heard over the septum ventriculorum; and in most cases a doubled second sound. The left ventricle was hypertrophied in many instances, but in others this effect of Bright's disease was prevented by the co-existence of some wasting and exhausting complaint. The correctness of these observations has been abundantly confirmed, and the signs in connection with the vascular system in cases of acute Bright's disease are now generally regarded as of considerable importance.

COURSE, DURATION, AND TERMINATIONS.—Acute Bright's disease presents considerable variations in these respects. *Recovery* may follow, either speedily or gradually. Complete restoration is indicated by disappearance of the dropsy; by subsidence of pyrexia, and return of the functional activity of the skin; and by the urine becoming abundant, clear, and of low specific gravity, while blood, albumen, and casts disappear, many of the latter assuming the *hyaline* character during the progress towards convalescence. Some fatty changes may be noticed, but they disappear in a favourable case. As a rule the dropsy subsides before the albuminuria, and the latter may hold on for a considerable time. Not uncommonly acute Bright's disease passes into a *chronic* form. *Death* may result from dropsy affecting important parts, such as the glottis; from inflammatory complications; or from uræmia.

DIAGNOSIS.—The circumstances under which it occurs; the peculiar train of symptoms; and the characters presented by the urine, in most cases render the diagnosis of acute Bright's disease quite easy. When the affection sets in insidiously, as with uræmic symptoms, there may be much obscurity at first. It must be remembered that *acute* Bright's disease may occur as an exacerbation of the *chronic* form, and an important matter bearing upon diagnosis is to determine whether such is the case, or whether the complaint is quite recent. This conclusion is founded upon the past history; the presence or absence of any sufficient and obvious cause of the acute attack; and the characters of the urine. Should much blood and renal epithelium be discharged, and should the microscopic elements in the urine not show signs of degenerative changes, the disease is probably recent and entirely acute.

PROGNOSIS.—Any organic disease of the kidneys is serious, especially if it is extensive, and if both organs are involved. Hence acute

Bright's disease is a grave affection. However, a large number of patients affected with this complaint recover completely; but there is always a danger lest it should lapse into the chronic state, and therefore it is necessary to watch the urine carefully for some time before giving a final prognosis. If, along with the subsidence of the symptoms, the albumen and other abnormal urinary ingredients steadily diminish, and the urine is gradually restored to its normal characters and composition, the prognosis is favourable. Even should slight albuminuria hold on for some time, accompanied with a few casts, the case may end in ultimate recovery. If albumen continues to be discharged in abundance for a length of time, the prognosis becomes more serious; much will depend also on the presence and characters of the casts, whether these show that the disease is subsiding, or that it is becoming confirmed, and that the epithelium is undergoing degenerative changes and destruction. Recovery cannot be considered satisfactory until every trace of albumen has permanently disappeared. The immediate prognosis is more grave if the urine becomes very scanty; and if it contains a large quantity of albumen, blood, and casts. The chief signs of proximate danger are the supervention of uræmic symptoms; œdema of the glottis or lungs; abundant pleuritic or pericardial effusion; severe erysipelas affecting dropsical parts; and the development of acute inflammatory complications.

TREATMENT.—A patient suffering from acute Bright's disease should be kept completely at rest in bed, in a warm and comfortable room, being well protected from draughts. In some cases it might be advisable at the outset to cup over the loins to the extent of from 6 to 12 ounces; but the removal of blood requires particular caution in this affection, on account of the tendency to anæmia, and it should be omitted if the patient is at all weak, and especially if chronic renal disease has previously existed. Free dry-cupping is often of great service, and may be resorted to when blood cannot be taken away. The diet must at first be kept low, especially as regards nitrogenous food, abundance of diluent drinks being allowed.

The most important object in the treatment of acute Bright's disease is to endeavour to get the skin to act freely and persistently. This is best effected by clothing the patient in flannel; placing him between blankets; and employing warm, hot-air, or vapour baths, repeated daily or less frequently, as circumstances indicate. Dr. William Roberts recommends the warm "blanket-bath." Internally full doses of citrate or acetate of potash or of liquor ammoniæ acetatis may be given, freely diluted, with a few minims of tincture of henbane. Some authorities highly recommend small doses of tartar emetic or antimonial wine. Jaborandi and subcutaneous injection of pilocarpin have also been employed with advantage. There is much difference of opinion as to the use of *diuretics*. Experience has proved, however, that certain of these agents may often be given with great benefit. In the first place the patient should drink water freely, for the purpose of eliminating and washing away the urinary solids and other materials which accumulate in the kidneys. All *stimulants* must be forbidden in the acute stage. In addition to the vegetable salts of potash already mentioned, cream of tartar, digitalis, and infusion of fresh broom-tops

have been beneficially employed in combating the dropsy of acute Bright's disease. The bowels should be acted upon freely by means of a dose of compound jalap powder every morning or on alternate mornings, which may be combined with cream of tartar. Later on podophyllin or elaterium may be required, if the dropsy does not subside.

Various *symptoms* frequently call for attention during the course of acute Bright's disease, especially vomiting and uræmic phenomena. The management of inflammatory complications, particularly those within the chest, is often a matter of much difficulty. Lowering treatment is decidedly not admissible, and on no account must mercury be given, as in renal diseases the smallest dose is liable to produce most serious salivation. The application of blisters or of turpentine likewise requires great care, as they tend to irritate the kidneys. Opium must also be avoided, or only given very cautiously. Sinapisms, warm fomentations or poultices, and chloroform epithems over the loins are the best local applications, and they are frequently of much service.

After the more acute symptoms have subsided, the use of the diaphoretic, diuretic, and purgative remedies must be moderated, and at this time the most valuable medicine is iron. Care is needed in commencing the administration of this drug, which should be given at first in a mild form and in small doses, its effects being carefully watched. The tincture of the sesquichloride, syrup of phosphate, ammonio-citrate, or ferrum redactum are the best preparations, and if the first is tolerated in full doses, excellent results are frequently brought about. Quinine may be combined with the iron, and this remedy is particularly recommended after scarlatina. The diet should be gradually improved, being made nutritious and digestible; and during convalescence a little wine may be given, provided it agrees with the patient. The greatest care is necessary at this time to guard against a relapse. The patient should always wear flannel all over the body, and avoid every possible exposure; indeed it is often advisable to enforce confinement to the bedroom until the albumen has quite disappeared, and for some time special precautions are needed. Afterwards a change of air to a warm and well-protected region is very beneficial; or this may be recommended if the disease shows a tendency to become chronic. Baths should be employed from time to time.

II. CHRONIC BRIGHT'S DISEASE.

There are certain well-marked varieties of this complaint recognized by most authors. The subject will, perhaps, be presented most clearly by first pointing out the *general ætiology* and *clinical history* of the disease; and afterwards considering the main facts pertaining to each special type.

GENERAL ÆTIOLOGY.—The chief causes of chronic Bright's disease are:—1. A previous acute attack. 2. Constant or frequent exposure to cold or wet, or to sudden changes of temperature. 3. Abuse of alcohol, particularly of ardent spirits. Dr. Dickinson has, however, attempted to prove that this cause has been greatly exaggerated.

4. Some constitutional diathesis or form of blood-poisoning, especially gout, syphilis, tubercular or scrofulous disease, chronic saturnism, and the fatty diathesis. The opinion is held by some pathologists that all forms of Bright's disease are of constitutional origin, the renal affection being but a local development of a general disorder. 5. Chronic disease of the pelvis of the kidney, bladder, urethra, or prostate gland. 6. Pregnancy.

Predisposing causes.—Chronic Bright's disease is more prevalent among males, probably from their more frequent exposure to its exciting causes; in adults; in those whose occupation involves exposure to cold and wet, or to sudden changes (*e.g.*, cabmen, labourers, puddlers, workers in glass), or greater temptations to intemperance; and among the poor. Want of cleanliness of the skin is a predisposing cause, and this is often combined with exposure and intemperance, the three together being peculiarly prone to originate Bright's disease.

GENERAL CLINICAL HISTORY.—In general terms the symptoms of chronic Bright's disease comprehend morbid conditions of the urine, especially albuminuria, the presence of casts and renal epithelium or sometimes of blood, and diminution in the excretion of urea and other urinary ingredients; frequent micturition, particularly by night; dropsical accumulations, liable to come and go, or to alter their seat rapidly; deficient action of the skin, which is almost always dry, and often rough and harsh; and changes in the blood, which becomes hydræmic and deficient in albumen and red corpuscles, with consequent pallor or sallowness of the skin, shortness of breath, and other symptoms, while excretory elements accumulate in it. Sometimes uneasiness or tenderness is experienced over the region of the kidneys. Headache and giddiness are frequently complained of; and serious uræmic symptoms are liable to arise at any moment. Serous inflammations, endocarditis, bronchitis, and pneumonia are also apt to supervene. Derangements of the digestive organs are very common, in the way of loss of appetite, dyspeptic symptoms, nausea or vomiting, flatulence, and irregularities of the bowels. Other *complications* liable to be met with are phthisis; cardiac disease; morbid conditions of the vessels; and hepatic affections. In certain forms of Bright's disease apoplexy is of frequent occurrence. The signs in connection with the heart and vessels described under acute Bright's disease were also noticed by Dr. Sibson in many cases of the different chronic forms, which likewise tend to originate hypertrophy of the left ventricle.

Drs. Sparks and Mitchell Bruce have arrived at the following practical conclusions from a number of careful observations of the effects of different kinds of diet, rest, and exercise upon the amount of albumen passed in chronic Bright's disease:—1st. That the albumen was reduced by an absolute milk diet, and by an absolutely non-nitrogenous diet; and that the effect of a non-nitrogenous diet was neither immediately produced, nor immediately arrested by the re-ingestion of nitrogen. 2ndly. That eggs in excess did not appreciably reduce the amount of albumen. 3rdly. That alcohol in the form of wine decidedly increased the albumen; and that digitalis had probably a similar effect. 4thly. That the albumen was remarkably reduced in amount by absolute rest, in the recumbent posture; and decidedly increased by exercise.

As regards the *mode of onset*, chronic Bright's disease not uncommonly remains after an acute attack; in most cases, however, it sets in gradually, and the affection may be quite latent until some grave uræmic or other symptoms reveal the serious condition present. In other instances there may only be albuminuria or slight dropsy. The disease is generally subject to remissions and subacute or acute exacerbations, the latter often coming on from a slight, or even without any obvious cause. The *duration* is very variable, some cases lasting for many years, and it differs in the several forms. Death is usually hastened at the close by uræmia; serous inflammations; pneumonia or bronchitis; dropsy, either on account of its dangerous situation, or from its exciting erysipelas or gangrene; or by apoplexy. A few cases terminate gradually by asthenia; in others death results from independent complications, such as phthisis. Recovery may ensue even after the disease has existed for a considerable time.

It is requisite to draw special attention to certain changes which may be observed in connection with the eye. The occurrence of temporary attacks of disturbance of vision associated with uræmia has already been alluded to. Dr. Gowers has noticed on ophthalmoscopic examination that the arteries of the retina are sometimes distinctly lessened in size; and considers that this depends on their contraction, and is as a rule in direct proportion to the tension of the arterial blood, as measured by the incompressibility of the radial pulse. The most important condition, however, which is met with in cases of chronic Bright's disease is a form of amaurosis, attended with definite morbid changes in the retina, as observed with the ophthalmoscope, viz., *albuminuric retinitis* and *hæmorrhages*. The loss of sight under these circumstances creeps on slowly and is permanent, though usually liable to sudden increase from various causes, with subsequent improvement. At first the appearances noticed are increased vascularity, with enlargement and tortuosity of the retinal veins, but shrinking of the arteries; and slight swelling around the disc, the margin of which becomes indistinct, while it becomes suffused and dark-red, a grey filmy exudation afterwards forming. The more characteristic appearances, however, are noticed later on, being due to the presence of numerous whitish or yellowish-white brilliant-looking spots or patches around the disc; with hæmorrhagic extravasations into the retina in the same locality. By the increase and union of the patches the disc is often surrounded with a zone, "the inner line of which is irregularly circular, or melts into the grey interval and the disc itself, while the outer presents salient angles, which correspond to the course of the larger vessels" (Allbutt). Whitish streaks are also seen radiating outwards along the vessels and nerve-fibres. In course of time the disc is itself invaded by the spots and hæmorrhages. Some observers affirm that the white spots always result from changes in blood-clots, but probably most of them are the result of independent exudation. Ultimately these may be absorbed, many of the vessels being obliterated or removed, causing retinal anæmia; while it is then seen that the choroid has also undergone marked changes, and that it presents yellow patches. Important structural changes are set up in the retina, choroid, and vitreous body. Both eyes are always involved, but not to the same degree.

These ocular changes are unquestionably found most frequently and distinctly in connection with the *granular contracted kidney*, but they have also been noticed in other forms. As to their immediate cause, they have been attributed to hypertrophy of the heart accompanying the renal disease; to some constitutional condition attended with changes in the vessels generally; to alterations in the blood, viz., uræmia or deficiency of albumen; or to extension of disease along the optic nerve from the brain.

Having given this general outline of Bright's disease, the prominent characters of the several varieties will now be pointed out.

I. LARGE, WHITE, SMOOTH KIDNEY.—CHRONIC DESQUAMATIVE OR TUBAL NEPHRITIS.

ÆTIOLOGY.—This form is most frequently a sequel of the acute disease. It may come on gradually from taking cold; as the result of repeated pregnancies; or in the course of phthisis. It is chiefly met with in comparatively young persons.

ANATOMICAL CHARACTERS.—The kidneys are enlarged and heavy, their surface being smooth and pale, but variegated with vessels; the capsule is readily separated, being unaltered or somewhat opaque. A section shows great thickening of the cortical substance, which is white or yellowish-white and opaque, often also presenting numerous small yellow spots or streaks, due to fatty degeneration—"granular fatty kidney" (Johnson). The consistence is diminished. The pyramids retain their normal colour, and contrast markedly with the cortex, though they are also affected to a less degree. Microscopic examination reveals enlargement of many of the tubes, which contain a great number of epithelium-cells, with exudation. The cells are always much altered, being swollen, clouded, and more or less granular, also frequently containing fat or oil-globules, or they may be quite disintegrated, so that only a granular *débris* remains, with masses of fat and oil-globules. Some tubules may be quite denuded and empty, or only present hyaline fibrinous moulds. The Malpighian corpuscles are either normal in size or a little enlarged, and their capsules are thin.

It is now generally conceded that in very chronic cases this form of kidney occasionally gradually contracts and wastes, and it may become markedly small and atrophied. How this change is brought about is, however, not positively determined. Some authorities maintain that it results from an interstitial inflammation, as in the cirrhotic kidney; others that it is entirely due to changes within the tubules. In this condition of kidney the capsule is more or less thickened, opaque, and adherent at parts; superficial depressions form, causing a somewhat granular appearance; while there is some increase in the interstitial tissue, with thickening of the blood-vessels. These changes are, however, not so marked as in the cirrhotic kidney, and they are mainly noticed in those regions where the tubular changes are most evident, and where blocked tubules are seen in all stages of destruction.

PATHOLOGY.—The generally accepted view of the pathology of the large white kidney is, that it is the result of *chronic tubular nephritis*,

attended with great increase and desquamation of the epithelium, the cells of which gradually undergo changes, ending in their complete fatty transformation and destruction. More or less loss of tissue, with consequent atrophy of the kidney, may follow in course of time.

SYMPTOMS.—Either remaining after an acute attack, as frequently happens, or being chronic from the outset, this variety of Bright's disease presents the following clinical features:—The urine is usually deficient in quantity; pale and often somewhat turbid, depositing a whitish sediment, or from time to time being smoky or tinged with blood; and of normal or rather high specific gravity; while it contains a considerable quantity of albumen, as well as various casts, with renal epithelium or its remains. The microscopic elements are not nearly so abundant as in the acute disease; by studying their prevailing characters much information may be gained as to the exact state of the kidneys. The chief casts met with are *epithelial*, the epithelium-cells being always more or less altered; *granular*; *large* or *small hyaline*; and *fatty*, as the renal structures undergo fatty changes. Anasarca is generally a prominent symptom, and serous effusions are not uncommon. The general surface, but more especially the face, presents the characteristic dull-white, puffy, and pasty aspect, being often also smooth and glossy, these appearances becoming more marked as fatty degeneration proceeds. There is considerable tendency to uræmia, and to the occurrence of serous inflammations. Dr. George Johnson states that mucous hæmorrhages are frequent in the advanced stages, especially epistaxis. Exacerbations are very liable to arise from time to time.

2. GRANULAR, CONTRACTED, OR CIRRHOTIC KIDNEY.—CHRONIC INTERSTITIAL NEPHRITIS:

ÆTIOLOGY.—In this variety the onset is always very chronic and insidious, being independent of any obvious *exciting cause*. The contracted kidney is chiefly associated with gout; chronic lead-poisoning; chronic alcoholism; a tendency to general degenerative changes; or, it is said, with repeated exposure to cold. The subjects of this form of renal disease are usually advanced in years.

ANATOMICAL CHARACTERS.—The prominent changes presented by the cirrhotic kidney are gradual contraction and atrophy, until the organ may weigh only an ounce or two; granulation of the surface, the granules ranging from the size of a pin's head to that of a pea or more, there being also irregular depressions, giving rise to a lobular appearance; thickening, opacity, and adhesion of the capsule, which is inseparable and sinks into the depressions; increased resistance and toughness of the renal tissue. These changes are observed in very different degrees of advancement in different cases. On making a section of the kidney it is seen that the cortical substance is chiefly wasted, having in some instances almost completely disappeared, what remains being of a red or brownish-red colour, and coarsely granular. There may be signs of fatty degeneration. Cysts are frequently observed, varying in size from very minute points to spaces as large as a

nut or even larger, and containing an albuminous fluid. In the gouty kidney a white deposit of urates forms without the tubules.

The intimate changes consist in a great increase of the intertubular connective tissue; with consequent alterations in the tubules, Malpighian corpuscles, and vessels. Many of the tubules are denuded of their epithelium, contracted, or obliterated; others are blocked up with disintegrated epithelium-cells; while still others contain clear fibrinous moulds. Fat-granules and oil-globules are often visible. The Malpighian bodies appear shrunk and abnormally close together, their enclosed glomeruli being more or less compressed by fibrous tissue. Many vessels are obliterated, and the walls of the smaller arteries are thickened, so that it is difficult to inject the kidney through its main artery. The cysts so frequently seen are probably due to obstruction or constriction of the ducts at intervals, with distension of the intervening portions.

PATHOLOGY.—It is in connection with the *cirrhotic kidney* that important differences of opinion have arisen as regards pathological questions. With respect to its *nature* and *mode of origin*, most German authorities consider it as being merely a later stage of the large white kidney, which, if it only lasts long enough, will become atrophied and granular; and some of their pathologists describe several stages in the progress of the morbid alterations in the kidneys. Though recognizing the fact that now and then the large kidney does waste and become granular, as has been already pointed out, yet most English writers are of opinion that the true cirrhotic kidney does not so originate, but that it is the result of *chronic interstitial nephritis*, attended with proliferation of the intertubular connective tissue, which becomes much increased, and compresses surrounding structures. Dr. Grainger Stewart, who formerly regarded this disease as a result of excessive growth of the renal connective tissue, now agrees with this view. Dr. George Johnson, however, considers that the *epithelial cells* are first affected, undergoing degeneration in consequence of having to perform unusual excretory work. Dr. Dickinson believes that the disease begins superficially, immediately under the capsule, and gradually extends inwards.

Before alluding to a view more recently advanced, it will be convenient to consider more particularly the morbid conditions of the heart and arteries which may be induced by Bright's disease, and which are found with special frequency associated with the contracted kidney. It must be borne in mind that the heart may be primarily diseased, and by inducing mechanical congestion may lead to organic changes in the kidneys, ending in contraction and atrophy, this condition being, as previously stated, regarded by some pathologists as a variety of Bright's disease. Again, affections of the cardiac valves may co-exist with renal disease independently, or as the result of the same constitutional dyscrasia; or they may be the consequence of endocarditis, complicating Bright's disease. It is, however, to cardiac hypertrophy, especially involving the left ventricle, and presumed to be a secondary result of the renal disease, that it becomes requisite to draw particular attention. There can be no doubt but that this condition of the heart does arise in many cases of chronic Bright's disease, and the question is, how is it originated? Formerly it was attributed to the altered state of the blood, which was

supposed to exercise an undue stimulant effect upon the heart, or to pass with difficulty through the capillaries, thus causing the heart to act with excessive vigour, and so to become hypertrophied. Traube advanced the opinion that destruction of the renal secreting tissue, and obstruction to the circulation in the kidney, lead to the hypertrophy, chiefly because under such circumstances a sufficient amount of water is not removed from the blood, and thus the arterial tension is increased; this view, however, he seems to have subsequently relinquished. Dr. George Johnson made the important discovery that the walls of the small arteries, not only in the kidneys, but also in various other structures throughout the body, become greatly thickened. This eminent observer maintains that the arteries contract, and oppose the passage into the tissues of the unhealthy blood associated with Bright's disease, with consequent rise in arterial tension; and that this is followed by hypertrophy of the muscular coat, which is the cause of the thickening of their walls. Dr. Gowers thinks that his ophthalmoscopic observations as to the contraction of the retinal vessels afford a direct proof in favour of the first part of this theory. Owing to the condition of the arteries it is supposed that the walls of the heart become also hypertrophied, in order to overcome the resistance thus offered.

Sir William Gull and Dr. Sutton have denied that the thickening of the small arteries is due to muscular hypertrophy; they affirm from their observations that these vessels, as well as the capillaries throughout the body, become the seat of a peculiar *hyalin-fibroid* change, which leads to thickening of their walls with loss of elasticity, and they attribute the cardiac hypertrophy to this *arterio-capillary fibrosis*, as it is termed. On these observations these authorities found another view as to the pathology of the granular kidney, viz., that it is but a part of a general morbid condition, beginning in the smaller vessels and affecting these throughout the body, which leads to atrophy of the tissues. In their opinion the vascular changes outside the kidneys are not the secondary result of the renal disease, but merely a part of the general disorder. The whole question still remains in a state of great uncertainty.

SYMPTOMS.—The contracted kidney may be clinically latent for a very long period. As regards the urine, this is as a rule abundant, being in some cases very copious; of light colour and low specific gravity; while it contains comparatively little albumen, or even none at all at times; there being also but few or no casts, which are chiefly *hyaline* and *granular*, with but little epithelium or fat. At the close the urine often becomes very scanty or suppressed. Dropsy is absent in a considerable number of cases from first to last, and generally is but slight, or is only observed at intervals. The skin is dry and harsh, but does not exhibit the peculiar pale and pasty aspect; while the face has often a sallow and pinched appearance. In most cases there is marked debility and constitutional cachexia. Dyspeptic disturbances are frequently very prominent. The *complications* most liable to be met with are cardiac hypertrophy, and morbid conditions of the vessels, the latter not uncommonly leading to apoplexy. Uræmia may supervene, but serous or pulmonary inflammations are much less frequent than in connection with the large white kidney.

3. FATTY KIDNEY.

Fatty changes are observed in connection with all forms of Bright's disease, but some authorities are of opinion that the kidney may become primarily the seat of a *fatty infiltration*, the renal cells being loaded with fat, the liver being in most cases affected at the same time. Dr. Johnson applies the terms *simple fat kidney* or *general fatty infiltration of the kidney* to this condition. It is stated that it may be associated with any of the usual causes of fatty infiltration. The kidneys are frequently enlarged, their cortical substance being uniformly pale or mottled with red, and occasionally hæmorrhagic spots are observed. The consistence is diminished, the kidney having often an œdematous feel and appearance. The microscope shows uniform distension of the renal cells with oil. There may be albuminuria and other symptoms of renal disease, but generally no obvious signs of functional derangement of the kidneys are observed (Johnson).

4. LARDACEOUS OR ALBUMINOID KIDNEY.

Most writers now classify the *lardaceous kidney* as a form of Bright's disease. Its *ætiology* and *pathology* are those of the general disease.

ANATOMICAL CHARACTERS.—There is by no means an agreement in the descriptions given by different observers as to the appearances presented by the amyloid kidney. Dr. Grainger Stewart recognizes three stages of the disease; in the first stage the vessels only being affected; in the second the renal tissues being infiltrated with the albuminoid material, and many of the tubules blocked with it; and in the third the organ being atrophied and contracted. Dr. Dickinson describes a somewhat analogous course of morbid changes. When the disease is marked, the kidneys are enlarged and pale, and their surface is smooth, the capsule separating readily. The consistence is very tough and hard. A section is sharp-cut, and shows the cortical substance to be pale, anæmic, waxy, and translucent, often dotted over with glistening spots, which correspond to the infiltrated Malpighian bodies, in which the deposit first occurs. The cones seem natural. The usual chemical reactions characteristic of albuminoid material are yielded. The renal cells are often cloudy, withered, or fatty, but they are stated not to afford the tests of albuminoid deposit. Transparent hyaline moulds are found in some of the tubules. In the advanced stage the affected organs may become much atrophied and irregular. In a case observed by Dr. Stewart,* the kidneys were found after death to weigh two and a half ounces each, the tubes were wasted, the Malpighian bodies were large and waxy, and closely grouped together, the fibrous tissue was relatively more abundant than in the healthy organ, but the capsules were at all points readily separable, and the organs did not present the appearances characteristic of cirrhosis. In opposition to this view, German writers deny that this marked contraction can take place in

* *British Medical Journal*, August 10th, 1878.

cases of simple albuminoid disease of the kidney, but that it is due to a simultaneous or previously existing cirrhotic process.

SYMPTOMS.—There is also much difference of opinion as to the clinical signs of albuminoid disease implicating the kidneys, and some writers maintain that they are very variable in different cases. Dr. Stewart affirms that when the disease is simple and uncomplicated, he has invariably found the symptoms distinct and uniform throughout. They seem to be of the following character. There is polyuria, the urine being very copious, pale and watery, depositing scarcely any sediment, and of low specific gravity, varying from 1005 to 1012 or 1015. At first albumen is either absent altogether, or is present only in very small quantity; later on it increases, and often becomes exceedingly abundant. Cases, however, have been described in which there was no albuminuria throughout, and Dr. Stewart states that this happens in rare instances. The urine presents little or no sediment, and very few casts are present, consisting mainly of the *small hyaline* and *finely granular* varieties; there may be some epithelium scales upon them, or these may be separate, being usually wasted, or containing oil-globules. The epithelial particles occasionally yield the reaction of albuminoid substance. Dropsy is absent, or almost completely absent, throughout. Cardiac changes are also wanting or comparatively slight; and uræmic phenomena are rare. Owing, however, to the frequent association of albuminoid disease with other forms of Bright's disease, the symptoms are liable to be much modified. If chronic inflammatory changes set in, the urine becomes much diminished in quantity, and its specific gravity raised; while there may be much sediment, with numerous *large hyaline* and *granular casts*. Dropsy also sets in, and may be very considerable, also occurring in cases in which albuminoid disease is added to previous inflammatory disease. There will usually be evidences of this condition affecting other organs, and its general symptoms will also be present.

5. MIXED TYPES.

It need only be remarked here that kidneys are sometimes met with presenting combinations of the morbid changes just described. Thus, there may be a combination of the *interstitial* and *tubal* forms of disease; or of *lardaceous disease* with either of these forms. As already remarked, *fatty changes* are common in all forms of Bright's disease.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. **DIAGNOSIS.**—The existence of one or other form of chronic Bright's disease is often quite evident from the *history* of the case; and from the *symptoms* present, the characters of the *urine* being especially important. Albuminuria may be the only sign of renal mischief, and therefore it is most desirable to adopt a routine practice of examining the urine, especially if an individual is persistently out of health without any obvious cause, or suffers habitually from dyspeptic symptoms, or from

headache or giddiness. Of course it must be remembered that albuminuria may be due to other causes besides renal disease, and especially to cardiac disease obstructing the venous circulation, or to admixture of albuminous fluids. Careful microscopic examination is necessary, in order to discover casts or renal epithelium, if these elements are present. The ophthalmoscope is highly important in diagnosis in some cases, and its employment has not unfrequently been the means of revealing Bright's disease where it was previously unsuspected.

The diagnosis between the different *varieties* of chronic Bright's disease is founded upon the conditions under which they severally arise; and upon their special symptoms, which have already been pointed out. The stage of degeneration of the kidneys, and the actual changes which are going on, may often be determined with much accuracy by a careful observation of the microscopic elements. The development of an acute inflammatory affection or of uræmic symptoms in the course of chronic Bright's disease not previously known to exist may prove very puzzling. The rule of always examining the urine will generally lead to the detection of the renal affection under such circumstances.

2. PROGNOSIS.—The prognosis in chronic Bright's disease, while always more or less unfavourable, differs much in different cases. The termination is most rapid in connection with the large white kidney, but much will depend on the exact nature and extent of the changes in the kidneys, as revealed by the urine. Patients suffering from this affection may live for many years, and may even enjoy comparatively good health. The circumstances which render the prognosis more unfavourable are a prolonged duration of the disease; steady diminution in the quantity of the urine, without corresponding increase in density; excessive albuminuria, with abundant granular and fatty casts or oil-globules; extensive dropsy, with serous effusions; obstinate dryness of the skin; marked cardiac hypertrophy and vascular changes; persistent dyspepsia or disturbances of the bowels; and constant pyrexia. It is remarkable, however, how much improvement in symptoms may be brought about in some apparently hopeless cases. There is always a danger at any moment of the supervention of uræmia; of acute exacerbations of the kidney disease; or of inflammatory complications, the last being very easily set up, and being much more grave than in healthy persons. Patients suffering from Bright's disease are extremely unfavourable subjects for injuries or operations.

3. TREATMENT.—Chronic Bright's disease requires very careful and varied management, and it is difficult to indicate any definite line of treatment which shall be applicable to all its forms. At the same time there are certain principles to be followed out, to which attention will now be directed.

a. It is very important to find out the *cause* of the disease, and to remove this if possible, such as abuse of alcohol, constant exposure, or suppuration setting up albuminoid disease. *b. Hygienic and dietetic* management demands careful and constant attention. In those cases in which there is merely albuminuria, this is often all that is needed. The patient must be completely clad in flannel, and avoid exposure,

especially to cold or wet weather, as well as to anything likely to cause a chill, and should take moderate exercise daily. If possible, a residence in a tolerably warm, equable, and sheltered district is advisable, or a temporary change to such a district should be recommended. A sea voyage is sometimes highly beneficial in cases not far advanced. It is very necessary to keep up a free action of the skin, by means of warm baths with friction, or it may even be advisable to employ occasionally a hot-air or Turkish bath. The diet requires supervision, and should be of a nutritious and digestible kind, though it is necessary to restrict more or less the consumption of nitrogenous elements of food. Milk may be usually taken in large quantities; and skimmed-milk has been specially recommended in the treatment of Bright's disease. Strong stimulants had better be avoided, but light wines or a glass of good bitter ale do good in many cases. The bowels must be kept well-opened daily, and the digestive functions maintained in good order. *c.* Treatment directed to the *constitutional state*, and to the *condition of the blood*, is of the highest value. The administration of iron, regularly and perseveringly carried out, often produces the most beneficial results, in the way of improving the state of the blood and general system. If it can be taken, the tincture of steel or the solution of perntrate is the best preparation, but the saccharated carbonate, ferrum redactum, syrup of iodide or phosphate, ammonio-citrate, or citrate of iron and quinine, are also very useful. Among other conditions affecting the constitution which require special attention are phthisis; albuminoid disease; gout; and saturnism. *d.* Some authorities consider it desirable to diminish the amount of *albumen* discharged in cases of Bright's disease, by means of the agents previously mentioned (Vol. ii. page 262). *e.* Dropsy is the principal *symptom* calling for interference in a large proportion of cases of Bright's disease. *Purgatives* and *baths* are chiefly to be relied upon for its removal. Among the former jalap, cream of tartar, elaterium, scammony, gamboge, and podophyllin are the most serviceable. Jaborandi or subcutaneous injection of pilocarpine may also be useful. Some practitioners give liquor ammoniæ acetatis freely with iron, to act as a *diaphoretic*; others recommend James's or Dover's powder. Opinions are much divided with regard to *diuretics*, both as to the propriety of giving them, and as to those which are most efficacious. In my experience certainly they are not of much use as a rule, and may do considerable harm. In extreme dropsy acupuncture, the use of Southey's trochars, or incision of the skin of the legs or scrotum may be required. Great care is necessary when carrying out these measures, in order to guard against erysipelas, which may be prevented by applying warm moist flannels, frequently changed and thoroughly cleansed before being re-applied; and by sponging the parts well before each application is made: some practitioners employ *antiseptic* washes. Particular care is also needed to avoid pressure upon dropsical parts, or their irritation by the contact of urine. Among other symptoms which are likely to require treatment are those indicative of dyspepsia; vomiting; derangement of the bowels; headache or vertigo; and uræmic phenomena. The remarks made under acute Bright's disease with reference to inflammatory complica-

tions apply likewise to the chronic forms of the disease. *f.* It is necessary to warn patients suffering from Bright's disease against the dangers to which they are exposed; and to impress upon them the necessity of paying strict attention to the hygienic matters already mentioned. Should cardiac hypertrophy be set up, with changes in the vessels, the danger of the occurrence of cerebral hæmorrhage should be borne in mind.

CHAPTER XLIV.

ON CERTAIN RARE DISEASES OF THE KIDNEYS.

I. CANCEROUS AND OTHER GROWTHS.

Of rare occurrence, renal cancer may be *primary* or *secondary*. It is most frequent in very young children, or after adult age; and in males. The variety met with is almost invariably *encephaloid*. The deposit is always in the nodular form when secondary; but when primary it may be either nodular or infiltrated. Secondary cancer does not attain any large size; but primary cancer frequently grows to enormous dimensions, usually giving rise to an irregular tumour. The consistence varies considerably, being sometimes very soft and almost fluctuating, while it is rarely uniform throughout. Hæmorrhage, softening, degeneration, and suppuration are liable to occur in the growth. The uninvolved renal texture is generally atrophied from pressure, or otherwise altered. Thickening of the capsule and adhesions to neighbouring parts are generally observed; while adjoining structures are frequently displaced or destroyed by pressure, the colon always lying in front of the tumour. The pelvis of the kidney and the ureter are often involved. In the great majority of cases only one kidney is affected. Secondary deposits are common, especially in the neighbouring glands.

SYMPTOMS.—The important clinical signs of renal cancer are severe pain in the lumbar region, generally shooting towards the hypochondrium and thigh or in some other direction, and subject to remissions or intermissions; tenderness; hæmaturia, in many cases profuse and irregularly intermittent, occurring without any obvious cause; and the presence of a *renal tumour*, the special characters of which are the rapidity of its growth, and the great size which it may attain, especially in children; its absolute immobility; as a rule its irregularly lobular feel; and its more or less firm though unequal consistence. Occasionally there is an obscure sense of fluctuation over some parts of it. In some cases the superficial veins over the tumour are much enlarged; and it has been known to present pulsation. Symptoms may arise from the pressure of the growth on surrounding structures. The detection of cancer-cells in the urine has been considered important, but several excellent observers doubt the possibility of recognizing these structures. Marked

emaciation and debility, with signs of the cancerous cachexia, are frequently observed; and there may be evidences of cancer in other parts of the body. The *course* of the disease is very rapid in children, but comparatively chronic in adults.

Of the *non-malignant* growths very exceptionally found in the kidneys may be mentioned osseous tumours; fibromata; sarcomata; lipomata; enchondromata; lymphatic or glandular growths; and syphilitic gumata. Some of these may form an evident tumour.

II. TUBERCLE.

There are three classes of cases in which tubercle is found in connection with the renal apparatus, viz.:—1. As a part of *acute miliary tuberculosis*, the kidneys being studded with grey granulations. 2. *Secondary* to tubercular disease in the lungs or other organs, when it does not usually give rise to any local symptoms. 3. As a *primary* formation, generally involving the kidneys, their pelves and ureters, the bladder, and sometimes the urethra; and being not uncommonly followed in the male by deposits in the prostate gland, testes, or vesiculæ seminales. The last constitutes much the most important group of cases. In the kidneys tubercle is seen at first in the form of grey or yellow nodules, occupying the cortex, which afterwards coalesce, become caseous, and break down, forming irregular abscess-like cavities, which burst into the urinary passages, discharging disintegrated tuberculous matter and pus. Generally both kidneys are implicated; and they are frequently extensively or completely destroyed. In the pelvis and ureters the growth starts in the submucous tissue, where it forms granules, and ultimately inflammation of the overlying membrane is excited, ending often in extensive ulceration and destruction. Occasionally one ureter becomes completely rigid, and its canal is blocked up, leading to pyonephrosis.

SYMPTOMS.—During the early period *primary renal tuberculosis* may be indicated by a dull pain in the region of the kidneys, with frequent micturition. The important symptoms, however, are those of chronic pyelitis or pyonephrosis, often associated with symptoms of cystitis; great wasting, debility, and hectic fever; and in time signs of implication of the lungs, intestines, or other organs. The urine is almost always deficient; slightly acid; and contains abundance of pus, frequently a little blood, but not in any large quantity, extra-renal epithelium cells, much granular detritus, and in some cases connective-tissue or elastic fibres. If the ureter is blocked up, a painful fluctuating tumour forms in the corresponding renal region, which may subside with coincident appearance of much pus in the urine, should the obstruction be removed. Uræmia is liable to arise if both kidneys are affected.

III. PARASITIC GROWTHS.

1. Occasionally one kidney, especially the left, is the seat of a *hydatid tumour*, which may ultimately attain a great size. It tends to burst into

the renal passages, its contents escaping with the urine; very rarely it opens in some other direction; or it may undergo any of the changes to which hydatid cysts are liable.

SYMPTOMS.—There may be none throughout. The most prominent sign of hydatid disease of the kidney is the existence of a renal tumour, rounded in form, though often somewhat irregular and lobulated; having an elastic or more or less fluctuating feel; and occasionally yielding hydatid-fremitus. As a rule there are no renal symptoms. Should the cyst burst into the urinary passages, important symptoms generally arise, namely, those of one or, more commonly, of several intermittent attacks of *nephritic colic*, due to the escape of the vesicles by the ureters; preceded by a sharp pain in the renal region, and occasionally by a sense of something having burst; and followed by signs of the passage of the hydatids along the urethra, that is, by great pain to the end of the penis, and constant desire to pass urine, with more or less retention; and finally by the appearance of the vesicles or their remains in the urine, frequently accompanied by some blood or pus. Occasionally a cyst blocks up the ureter, and thus leads to hydronephrosis. Inflammatory symptoms arise should the tumour become inflamed; or various symptoms may occur from its bursting in different directions.

2. The *cysticercus cellulosus* has been found in the kidneys.

3. The following *entozoa* are met with occasionally:—*a. Bilharzia hæmatobia*. This worm is found in some other structures, but it is most injurious in connection with the bladder, ureter, and pelvis of the kidney, being deposited in the minute veins of the mucous membrane lining these parts. It belongs to the *trematoda*, being about 3 or 4 lines long, of soft texture, and bisexual. The morbid effects which it may occasion are hæmaturia, it being, as previously stated, regarded as the cause of the *endemic hæmaturia* of certain hot countries; the formation of raised, injected, and ecchymotic patches in the mucous membrane; local inflammation ending in suppuration; obstruction of the ureters, with consequent hydronephrosis or pyonephrosis; and the formation of calculi, owing to the masses of ova forming a nucleus for urinary deposits.—*b. Strongylus gigas*. This is a *nematoid* worm, resembling in general characters the *ascaris lumbricoides*, but being much larger, having a reddish colour, and presenting six nodular papillæ about the mouth. It is found in the kidney and urinary passages, and necessarily tends to give rise to considerable disturbance, but of no definite character. *c. Pentastoma denticulatum*. Supposed to be the larva of a worm, this appears as a very minute encysted parasite, $1\frac{1}{2}$ lines long, club-shaped, with a double pair of hooks, and devoid of sexual organs.

IV. CYSTIC DISEASE.

Dr. William Roberts describes the following varieties of cysts which may be met with in connection with the kidney:—1. Scattered cysts in kidneys otherwise healthy, which now and then attain a great size, so as to form a fluctuating tumour. 2. Disseminated cysts in the atrophic form of Bright's disease. 3. Congenital cystic degeneration. 4. General cystic degeneration in adults. The last affects both organs, but to diffe-

rent degrees. They become much enlarged, and are converted into a mass of closely aggregated but distinct cysts, lodged in an abundant matrix of connective tissue; varying much in size; and containing either a limpid yellowish or reddish serum, or a gelatinous substance, this yielding albumen but not urinary ingredients; subsequently other materials are often added. The renal tissue is partially or almost completely destroyed. The cysts do not as a rule open into the pelvis, which, with the ureter and bladder, is usually quite healthy. As to the *origin* of these cysts, they have been attributed to dilatation of the Malpighian capsules; or to distension of limited portions of the tubules which have been obstructed at each end. During life this condition may give rise to a tumour, which is sometimes extremely large. The urine is occasionally increased in quantity, and is generally of low specific gravity. The fatal termination is often preceded by uræmic symptoms.

V. HYDRONEPHROSIS—DROPSY OF THE KIDNEY.

Hydronephrosis may result from any permanent closure of the ureter. It is frequently congenital, but may arise subsequently from impaction of a calculus or other body in the ureter; organic changes in its walls leading to stricture, such as ulceration followed by cicatrization; or external pressure upon it by a tumour. As the result of this obstruction, the pelvis and the portion of the ureter above the impediment become dilated from accumulation of urine; this subsequently causes flattening of the papillæ, and gradual compression and atrophy of the pyramids of the kidney, followed by wasting of the cortex, with distension of the capsule, until ultimately nothing may be left but a membranous sac containing fluid, either single or divided into chambers, and sometimes attaining an enormous size. The fluid consists usually of altered urine, this being much more watery than the normal secretion, almost always a little albuminous, and sometimes presenting an admixture of blood, pus, or epithelium. As a rule only one kidney is affected, while the healthy organ becomes hypertrophied.

SYMPTOMS.—Evidence of some cause likely to give rise to obstruction of the ureter may help in the recognition of hydronephrosis. The only positive sign, however, is the development of a painless, soft, and more or less fluctuating renal tumour, which sometimes feels lobulated; unaccompanied with any unusual characters of the urine. Occasionally the obstruction is removed, and the tumour suddenly subsides with copious discharge of urine, which is highly characteristic; the sac may afterwards shrivel up. It may be necessary for diagnostic purposes to use an exploratory trochar or the aspirateur. The tumour may occasion symptoms by pressing on surrounding structures. It is a curious fact that in cases of double hydronephrosis uræmic symptoms do not arise for a considerable time. Most cases ultimately terminate fatally in various ways. In extremely rare instances the sac ruptures spontaneously.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. DIAGNOSIS.—In most of the rare affections just considered, the chief matter in diagnosis is to determine the nature of a *tumour in the renal region*. It will be well, therefore, to enumerate all the conditions to which such a tumour might be due, and they include *renal abscess*; *pyonephrosis*; *perinephritis*; *cancer* or a *non-malignant growth*; *hydatid disease*; *hydronephrosis*; or *cystic degeneration of the kidney*. The distinctive features of these morbid conditions have been sufficiently pointed out in their several descriptions, the characters of the enlargement, as well as those of the urine, being important elements in diagnosis. It may be requisite to employ an exploratory trochar or the aspirateur before any positive conclusion can be arrived at. The tumour may become so large as to fill the abdomen, so that it becomes impossible, except by the history, to recognize its origin; and when due to an accumulation of fluid, it may come to simulate ascites. A renal tumour may be mistaken for one in connection with the ovary, uterus, supra-renal capsule, liver, spleen, or neighbouring absorbent glands; or for an accumulation of fæces in the intestines.

2. PROGNOSIS.—The prognosis of the diseases described in this chapter is very unfavourable. Cancer is necessarily fatal. Accumulations of fluid in connection with the kidneys, especially if of a purulent character, are exceedingly dangerous, owing to their effects upon the renal structure; the constitutional disturbance which they often set up; and the dangers of the supervention of uræmia, or of the discharge of the fluid into the abdominal cavity.

3. TREATMENT.—If anything can be done for the rarer forms of kidney disease now under consideration, *operative interference* is generally called for. In *hydronephrosis* the first principle is to endeavour to remove the obstruction which causes the retention of urine, and frequent manipulation or shampooing over the renal region has sometimes been found effectual for this purpose. If this does not succeed, and there are indications of danger, tapping must be resorted to, by means of the aspirateur or a small trochar, and the operation should be repeated if necessary. *Hydatid tumour* must be treated in the same manner as hydatid disease of the liver. The removal of the kidney for *cancer* or other solid tumour is scarcely permissible, but has been performed. *Tubercular pyelitis* requires similar treatment to other forms of this disease, the constitutional condition being attended to at the same time.

CHAPTER XLV.

URINARY CALCULUS AND GRAVEL.

THE full consideration of this subject comes more appropriately within the scope of surgical works, and here it is only intended to give a brief outline of its main facts. By *gravel* is meant very small concretions, which are often passed in the urine in large numbers.

VARIETIES OF URINARY CALCULI AND THEIR CHARACTERS.—1. *Uric Acid*.—This is very common, both in the form of calculi and gravel, being especially associated with the gouty diathesis, and hence occurring mainly in elderly persons, and among those of the upper classes. The concretions are formed in very acid, high-coloured, concentrated urine. They are hard; heavy; minutely tubercular or smooth on the surface; generally oval and compressed; as a rule small or of moderate size; and variously coloured by urinary pigments. There may be several. 2. *Urates*, chiefly consisting of urate of ammonia. These form soft, irregular concretions, which are deposited from acid urine, almost always in the kidneys, and nearly limited to young children. They are soluble in hot water. 3. *Oxalate of lime* or *Mulberry calculus*.—This variety is characterized by the surface being rough and tuberculated, like a mulberry. The calculus is of moderate size; generally spherical; very hard; and dark brown or almost black in colour. 4. *Phosphatic calculi*.—The important variety is the *fusible calculus*, consisting of a mixture of calcic and ammonio-magnesian phosphates. It is almost always formed in the bladder, and on a nucleus of some other material. There is no limit to the size to which it may attain. The texture is loose and friable, easily breaking down, and presenting a chalky or earthy appearance. Crystals of triple phosphate often stud the surface. By heating with the blowpipe, this calculus fuses into an enamel-like material. Another rare variety is the *basic phosphate of lime* or *bone-earth calculus*, which is very white, chalky-looking, and soft. The exceptional urinary calculi include:—5. *Carbonate of lime*. 6. *Cystine*, usually ovate; yellow, but changing to pale green on long exposure to light; lustrous; mammillated on the surface; friable and soft. 7. *Xanthine*. 8. *Fatty or saponaceous concretions*. 9. *Fibrinous and blood concretions*. 10. *Alternating*, consisting of alternate layers of two or more primary deposits.

PATHOLOGY AND ANATOMICAL CHARACTERS.—Most of the calculi mentioned are of *renal* origin, being derived from a deposit from the urine as it is first excreted, and being formed either within the tubules of the kidney, in its pelvis, or in the infundibula. Such are termed *primary calculi*, and the theories as to the cause of their formation are:—1. The presence of excess of certain normal ingredients in the urine (uric acid, oxalates, &c.); or of some sparingly-soluble abnormal ingredient (cystine, xanthine). 2. Certain conditions of the urine diminishing its solvent power over some of its constituents, such as excessive acidity, or deficiency of chloride of sodium and alkaline phosphates, diminishing the solubility of uric acid and urates; or alkalinity from fixed alkali leading to a deposit of bone-earth phosphate, or of carbonate of lime. 3. The presence of some body suitable to form a nucleus for deposits, for example, a clot of blood, ova of entozoa, or little clumps of urate of soda. 4. The presence of mucus or other colloid substance in some part of the renal apparatus, causing precipitation of urates or oxalate of lime in a globular form, intimately mixed with the animal matter, and thus forming a nucleus for further deposit. (Vandyke Carter and Ord.) The *mixed phosphatic calculus* is almost always formed in the *bladder*, and results from decomposition of the urine, which becomes ammoniacal, this condition being, as already

explained, favourable for the deposition of earthy phosphates, which are often mixed with a little urate of ammonia and carbonate of lime. Hence it is described as a *secondary calculus*, and the deposit always takes place on some nucleus, this being generally itself a calculus which has passed into the bladder. If the urine is retained in the renal pelvis until it becomes ammoniacal, a phosphatic calculus may form there.

In structure a urinary calculus usually consists of a *central nucleus*, surrounded by the *body*, and outside all there may be a phosphatic *crust*. The nucleus may or may not be of the same composition as the rest of the calculus; or sometimes it consists of some foreign body, or of mucus or blood. A section generally shows a stratified arrangement, but it may be partly or entirely radiated. Blended into the structure, of urinary calculi there is always a little organic matter, including mucus, epithelium, pus, or pigment.

The morbid effects liable to be excited by renal calculus are:—
 1. *Hæmorrhage*, from direct injury to some part of the urinary apparatus. 2. *Renal congestion*; or *inflammation* ending in *abscess*. 3. *Pyelitis* or *pyonephrosis*. 4. *Hydronephrosis* and *renal atrophy*, as the result of impaction in the ureter. 5. *Cystitis*. Occasionally urinary calculi become lodged in cysts or pouches, and give rise to no further mischief. It sometimes happens that one ureter is already occluded, and a stone lodges in the pervious one, leading to complete suppression of urine, with consequent uræmia. Very rarely a stone makes its way out of the renal apparatus into other parts, such as into the peritoneum or intestines.

SYMPTOMS.—The clinical signs of urinary calculus are chiefly the consequence of the effects above mentioned, and need not be described here. It is only requisite to point out what symptoms are suggestive of the lodgment of a stone in the kidney or its pelvis; and to describe those which are characteristic of its passage along the ureter to the bladder.

The symptoms of *calculus in the kidney* are pain over the renal region, of a dull aching character, but also frequently shooting towards the testes and thighs; pain at the end of the penis; frequent micturition; and the presence in the urine of blood, pus, epithelium from the pelvis and infundibula, or of considerable unorganized sediments, such as uric acid or oxalates. These phenomena are usually aggravated by anything which disturbs the position of the calculus, especially by violent exercise or jolting, after which the symptoms often assume the characters of *nephritic colic*, this in its typical form being due to the passage of a calculus along the ureter to the bladder. *Nephritic colic* is characterized by sudden excruciating pain in one renal region, shooting in various directions, but especially towards the hypogastrium, testis, end of the penis, and inside of the thigh; great restlessness, the patient tossing about in all directions in order to try to obtain relief; constant desire to micturate; the urine, however, being very scanty or suppressed, any that may be passed being high-coloured, often bloody, and discharged in drops with much burning pain; retraction of the testicles; collapse and faintness; with cold clammy sweats, and a very feeble pulse; generally distressing nausea and vomiting; great anxiety; and sometimes

spasmodic movements of certain muscles, or general convulsions. The attack lasts a variable time, there being commonly temporary remissions, and if the calculus reaches the bladder, the symptoms usually subside with equal suddenness, affording a sense of intense relief, and the patient may be conscious of something having fallen into the bladder. If the attack lasts for some time, more or less pyrexia is liable to be set up.

DIAGNOSIS.—Patients often complain of pain in the renal region, and imagine that they are suffering from gravel or stone, but such pain is commonly due to extra-renal conditions, such as myalgia, neuralgia, accumulations in the colon, or other causes. Should there be reason to suspect the existence of a *renal calculus*, careful and repeated examination of the urine must be made, particularly for uric acid and oxalates, for epithelium from the urinary passages, or for traces of blood or pus; and it may be well to do this after the patient has taken some severe exercise. As a rule *nephritic colic* is easy to diagnose, but the same symptoms may result from the transit of a blood-clot or of a hydatid vesicle. An attack may also be simulated by the passage of a gall-stone; by severe neuralgia; or by intestinal colic. When a stone reaches the bladder, it can usually be discovered by surgical examination.

PROGNOSIS.—Urinary calculus may be attended with a good many dangers. It may produce extensive disorganization of the kidney; or its passage to the bladder may prove fatal. If a stone is very large, or if there are several calculi, the prognosis is more grave. Calculus is a disease liable to recur.

TREATMENT.—The treatment of urinary calculus is very important. 1. In the first place measures should be taken to *prevent* its formation, if the urine gives indications that there is any danger of the occurrence of this event; or if there has been a previous history of stone. The chief general measures requisite for this purpose are to recommend the patient to drink water freely, so as to maintain the urine in a diluted state; not to allow too long intervals between meals, but to take four or five light meals during the day; and not to remain too much in the recumbent posture, the hours of sleep being moderate. Uric acid calculus is further guarded against by strict regulation of diet, which must be mainly farinaceous, all heavy meals, as well as much meat and rich wines, being avoided; and by administering moderate quantities of bicarbonate or citrate of potash. Oxalate of lime calculus is prevented by keeping the urine very dilute; maintaining the activity of the skin; avoiding certain vegetables rich in oxalates, especially rhubarb and sorrel, and also calcareous waters; and giving alkaline carbonates. Phosphatic calculus is obviated by careful attention to the bladder, if this organ is diseased; and by endeavouring to change the character of the urine. Should this excretion be ammoniacal, it may be desirable to wash out the bladder with dilute acids. 2. It has been deemed possible to *dissolve* calculi after their formation—those of uric acid in the kidneys by administering acetate or citrate of potash freely, in large and frequently repeated doses, continued for a long time; phosphatic calculi by dilute acid injections into the bladder. 3. For *nephritic colic* the remedies are the free administration of opium by the mouth, or

rectum, or subcutaneous injection of morphia ; belladonna, if opium is not admissible ; warm baths, with fomentations or poultices over the loins ; and the abundant use of warm demulcent drinks. It may be necessary to cup over the loins. Change of posture and manipulation along the ureter have been said to aid in the passage of a calculus. If the pain is extreme, it may be desirable to administer chloroform. Vomiting and collapse must be attended to. 4. *Surgical treatment* is of course usually required when a stone reaches the bladder ; and in rare instances it has been found necessary to remove a large calculus by operation from the pelvis of the kidney, but only if it has led to the formation of a renal abscess. The treatment of the pathological conditions which may be induced by stone have already been sufficiently considered in their respective chapters.

CHAPTER XLVI.

CYSTITIS—VESICAL CATARRH.

DISEASES of the bladder are mainly surgical, but it is necessary to allude to cystitis, as this complaint is not uncommon in medical practice.

ÆTIOLOGY.—The causes of vesical catarrh are :—1. *Direct irritation*, especially by calculi and morbid growths ; or resulting from certain conditions of the urine, as after taking excess of cantharides, copaiba, beer or spirits, but particularly when this fluid becomes ammoniacal as the result of retention from some impediment to its escape, or from paralysis of the bladder in consequence of spinal disease. 2. *Extension* of inflammation in the vicinity, especially that of gonorrhœa. 3. *Exposure to cold or wet.* 4. *Acute exanthemata* occasionally.

ANATOMICAL CHARACTERS.—*Acute* cystitis is characterized by redness, swelling, and softening of the mucous membrane ; with the formation of excess of mucus, and the detachment of epithelium with numerous young cells. In the *chronic* form the colour becomes often dirty grey or brown ; and there is thickening of the tissues, with, in time, hypertrophy of the muscular coat of the bladder, the walls becoming much thickened and tough. Abundant muco-purulent or purulent matter forms in the bladder, and the surface may ulcerate or even become gangrenous, or suppuration between the coats may take place, ending in extensive destruction and structural changes. The urine is generally decomposed and ammoniacal. This has been supposed to be the result in some cases of an alkaline fermentation set up by the mucus formed in the bladder. Niemeyer and others, however, have advanced the opinion that this decomposition is generally the consequence of the repeated use of dirty catheters, by which low vital organisms are introduced into the bladder.

SYMPTOMS.—The prominent symptoms of *acute* cystitis are uneasiness and a sense of heat over the bladder, in the perineum, and along the

urethra; in some cases tenderness over the hypogastrium; constant inclination to micturate, and a difficulty in retaining the urine, a few drops being passed, causing great pain and a sense of burning; and the presence of more or less mucus in the urine. There may be some degree of pyrexia. The chief indication of *chronic* cystitis is derived from the characters of the urine, which contains much mucus and epithelium, or pus, or sometimes blood; and if the urine is ammoniacal, the pus is converted into a gelatinous, ropy, adhesive substance, which can only be poured with difficulty from one vessel into another, and may be drawn out into strings. After a while much constitutional disturbance is often excited, with a tendency to hectic fever; and if extensive suppuration or gangrene should be set up, low typhoid symptoms are liable to arise, or those indicative of peritonitis may supervene.

TREATMENT.—In the first place the *cause* of cystitis must be removed, if possible, especially when this is in the form of a local irritant. In acute cases warm baths and hot fomentations or poultices over the hypogastrium, to which opium may be added, are of service. In some instances removal of blood, by means of a few leeches, is advisable. The bowels should be kept well-opened, for which purpose enemata may be employed. Suppositories of opium or belladonna may be valuable for relieving the local sensations. Barley-water, and similar drinks should be allowed freely, and citrate of potash administered, well-diluted, along with tincture of henbane or opium.

In chronic cystitis it is important to see that the bladder is properly emptied, and should a catheter be required, care must be taken that this instrument is quite clean, and it may be well to smear it over with some antiseptic. If there is irritability of the bladder, liquor potassæ or the bicarbonate or a vegetable salt of potash should be given freely diluted, and the salts may be combined with tincture of hyoscyamus. Repeated warm baths are serviceable, or local fomentations may be employed. Stimulants must be avoided, and diluent drinks given freely. Should there be a catarrhal condition of the bladder, attended with the formation of much mucus or pus, it may be desirable to wash out this organ with warm injections containing some antiseptic, or with very dilute astringent or acid injections. Under these circumstances the best internal remedies are dilute nitric acid, with decoction of pareira, buchu, or uva ursi, and tincture of henbane; or balsam of copaiba with liquor potassæ.

CHAPTER XLVII.

DISEASES OF THE ABSORBENT SYSTEM.

THE absorbent system occupies a prominent place in relation to several important pathological processes and conditions, and is at the present time receiving considerable attention from pathologists. An illustration of these relationships, it may be mentioned that this system is

undoubtedly concerned in many septic conditions, and one of the most recent writers on the subject, Mr. Messenger Bradley,* classifies glanders, malignant pustule, snake bite, dissection-wounds, and erysipelas as forms of septic lymphangitis. Moreover, it is supposed to play an important part in relation to various zymotic diseases, such as plague, typhus, typhoid, and diphtheria. The serous cavities are also now regarded as parts of the lymphatic system, and some cases of inflammation of serous membranes, for instance, of puerperal peritonitis, are considered as being due to lymphangitis. Again, the absorbents are concerned in conveying to various parts of the body morbid products, such as those of cancer, syphilis, and tubercle; and they are often involved in connection with diseases of internal organs. Some structures consist mainly of lymph-follicles, and their chief diseases are associated with these follicles. Certain skin-diseases, such as erythema, have been attributed to inflammation of the lymphatic rootlets; and changes in the lymphatics seem to constitute an important element in the morbid anatomy of elephantiasis and several other affections. These illustrations will suffice to show the importance of the pathological relations of the absorbent system; but in this chapter it is intended to deal only with the more obvious local affections of its vessels and glands, and these need be only briefly discussed, as they belong chiefly to the domain of surgical practice.†

A. CLINICAL CHARACTERS.

The signs to be sought for as indicating disease of the absorbent vessels and glands are:—1. **Morbid sensations** in these structures, especially pain, tenderness, and often a feeling of stiffness in the glands. 2. **Objective changes.**—The superficial lymphatic vessels are visible in certain conditions, and may be dilated. The glands are also often enlarged, this being generally accompanied with some change in consistence. The enlargement may be limited, or may affect the glands extensively throughout the body, not uncommonly giving rise to considerable tumours. The superficial glands are either separate and distinct; or they tend to form nodular, irregular, firm masses, owing to a number of glands being aggregated together; or chains of these structures may be involved. Those of the neck, axilla, and groin are most commonly affected. In the chest they may give rise to the *physical signs* of a mediastinal tumour. They can frequently be felt in the abdomen by making steady deep pressure, or by grasping portions of the abdominal walls, either as separate nodules, or as a distinct tumour. The latter is deeply situated, nodular, and fixed, being usually not very large. 3. **Interference with the passage of lymph and chyle.**—It has been supposed that obstruction to the passage of lymph may lead to its coagulation, and to the production of a kind of solid cedema. Interference with the progress of the chyle will gravely affect the nutrition of the body, thus inducing more or less

* "Injuries and Diseases of the Lymphatic System," 1879.

† For the most recent information concerning the Lymphatic System, the reader is referred to the Gulstonian Lectures for 1879, by Dr. Curnow.

emaciation. 4. **Escape of lymph or chyle.**—This may take place from the vessels or glands, and may also lead to serious consequences. 5. **Evidences of pressure upon, irritation, or destruction of neighbouring structures.**—These result from enlarged glands, and will of course vary with their situation. Neuralgic pains and localized oedema are not unfrequent symptoms, owing to contiguous nerves and veins being interfered with. Venous thrombosis may also be caused by obstruction of the circulation. In the chest and abdomen more or less pressure-signs may be present, as in the case of other tumours. By the irritation of the glands, inflammation of serous membranes and other structures may also be excited. They are further liable to undergo destructive changes, which may implicate neighbouring parts, thus tending to cause serious mischief. For instance, they may suppurate and destroy the cutaneous structures; in the chest they may lead to destruction of portions of the lungs, or to perforation of air-tubes or vessels; in the abdomen to perforative peritonitis, or to perforation of the bowels. 6. **Constitutional symptoms.**—These are of much importance, necessarily differing in their characters* according to the nature of the morbid condition. They may depend upon the disease of the lymphatic system, which, for example, may induce pyrexia or septicæmia; or such disease may be but a part of some constitutional affection, which also causes the general symptoms.

B. SPECIAL DISEASES.

1. **Acute Inflammation — Lymphangitis — Angeioleucitis — Adenitis.**—The lymphatic vessels may be alone inflamed—*lymphangitis* or *angeioleucitis*; or merely the glands—*adenitis*; or both sets of structures may be implicated. Usually the affection is limited to some particular part, but in the septic forms of inflammation the absorbent system is extensively involved.

ÆTIOLOGY.—This class of affections may be of *traumatic* origin, being due to various forms of injury, such as wounds, contusions, or strains; or they result from various kinds of irritation, such as that induced by neighbouring inflammation, suppuration, ulceration, or diseases of joints. External irritation, as, for instance, the strong heat of the sun, may induce superficial lymphangitis. Special forms of inflammation of the absorbent system are set up by particular kinds of irritation, such as that of gonorrhœa or the syphilitic virus; and septic forms of the disease are induced by various septic poisons. The lymphatics connected with the internal organs are often inflamed when these are the seat of any irritation. Pus has been found in the neighbouring lymphatics in cases of purulent pleurisy. Some forms of pelvic cellulitis have also been regarded as being due to lymphangitis. Inflammation may be immediately excited in the vessels and then travel along to the glands; or the irritation may be conveyed by the current of lymph to a more or less distant part, the intervening portion being unaffected; or the glands may be implicated by extension from the surrounding cellular tissue. When a gland is involved, while the vessels

between it and the source of irritation are unaffected, the inflammation is said to be *sympathetic*. Lymphangitis may set in very rapidly.

ANATOMICAL CHARACTERS.—Lymphangitis is distinguished as *reticular* or *tubular*, according as the fine capillary network or the trunks of the vessels are involved. In the former case the skin and its capillaries are usually involved. In the latter variety the vessels become dilated, and their walls are thickened; the endothelium often disappears; and the internal coat becomes opaque and uneven. The lymph coagulates in their interior, blocking up their channels, and the clot may become organized, obliterating the vessels permanently; or occasionally it softens and suppurates in the centre, and the pus may find its way into the circulation, leading to septicæmia or pyæmia. Exudation also takes place, while the surrounding cellular tissue undergoes hyperplasia and becomes thickened. Lymphangitis may lead to inflammation in joints, which may be of a purulent character. In adenitis the affected glands become congested and swollen, as well as the seat of exudation, while the passage of the lymph through them is impeded. Resolution may take place after a time, but not uncommonly the inflammation terminates in suppuration, this beginning in the centre, the cavities of the glands becoming filled with pus, and the surrounding cellular tissue being also involved. In other cases the glands remain more or less indurated, and they may form adhesions to the surrounding structures, especially if the irritation is repeated several times.

SYMPTOMS.—When the superficial lymphatic vessels or glands are inflamed, this condition is evidenced by objective signs. Lymphangitis is indicated by wavy or straight red lines, running towards the glands; or sometimes there are isolated red patches, the skin and its capillaries being involved along with the lymphatics. The large vessels may be felt as firm and knotted cords. If the glands are affected, these can be felt and seen to be more or less enlarged and swollen, at first feeling firm. At the same time pain is experienced, often very acute, with sensations of heat, stiffness, and tenderness. When the affected structures are deeply situated there are no red lines, and redness is not always present. There is induration of the part, more like that of oedema than inflammation. The inflammation may, however, pass through the intervening tissues from the deep to the superficial lymphatics, and *vice versâ*. Owing to the interference with the passage of the lymph, more or less swelling from lymphatic oedema is often present, of a firm character, and a limb may be much enlarged from this cause. If suppuration should take place in glands, this will be evidenced by the ordinary signs characteristic of an abscess. There is more or less pyrexia, in proportion to the extent and intensity of the inflammation. In septic forms of lymphangitis signs of general septicæmia are likely to arise.

2. Chronic Adenitis.—The lymphatic glands are liable to chronic inflammation, which either remains after one or more acute or sub-acute attacks; or comes on gradually. The glands are then enlarged and indurated, and may be a little painful. They may subsequently suppurate, or undergo a caseous degenerative change, but often remain unaltered for a considerable time. This condition of the glands interferes with the passage of the lymph through them; and also renders

them more subject to attacks of acute inflammation from slight causes.

3. Obstruction of the Absorbent Vessels.—This condition may involve the lymphatic capillaries, their main trunks, or the thoracic duct itself. It may result from the blocking-up of their channels by coagulated lymph; from inflammation of the walls of the vessels; or from external pressure. Thus the thoracic duct may be more or less obstructed, or even completely obliterated, by the pressure of enlarged glands in the thorax, or of an aneurism. The lymphatic trunks in the limbs may also be compressed by glands, aneurisms, and other morbid conditions; and even the capillaries are subject to pressure in consequence of inflammation of the surrounding cellular tissue. Obstruction of the thoracic duct is said to arise from disease of its valves. It may be remarked, further, that a certain degree of obstruction to the flow of the lymph and chyle may arise from marked interference with the venous circulation, as the result of cardiac disease or direct obstruction of the principal veins.

If the thoracic duct is obliterated, grave general symptoms arise, namely, marked wasting and anæmia, tending towards a fatal issue, if the chyle cannot reach the venous system in consequence of the establishment of a collateral circulation. Various degrees of obstruction of this channel have, however, been found in several cases at *post-mortem* examinations, in which no symptoms had been observed during life. The most obvious direct effects of obstruction in the absorbents are dilatation of the vessels behind the impediment, in the course of the circulation; and the development of lymphatic oedema. These conditions necessarily vary much in their extent and degree, according to the situation and character of the obstruction. The dilatation may ultimately lead to rupture of the vessels.

4. Lymphatic Dilatation—Lymphangiectasis.—Dilatation may affect the capillary network of the lymphatics, more commonly the larger trunks, or occasionally the thoracic duct or the receptaculum chyli. It presents various degrees, and assumes different forms. Thus there may be merely a localized reticular dilatation of the lymphatic capillaries; or more frequently varicose, saccular, tubular, fusiform, or cirroid dilatation of the trunks; or the enlarged vessels may form a distinct growth, named *lymphangioma* or *lymphangiectodes*, which has been divided by Wagner into the three varieties—(a) *simple*; (b) *cavernous*; and (c) *cystoid*, in which cysts are developed. Moreover, enlarged lymphatics constitute an important element in the structure of elephantiasis and other growths. The thoracic duct and receptaculum chyli may be enormously dilated, the former in extreme cases reaching the size of the little finger, or even attaining larger dimensions than this. The deep lymphatics and the lacteals are liable to dilatation, as well as those on the surface.

Lymphangiectasis is in many cases congenital, and it has been supposed that this may be due to a want of specialization in the lymphatic system of certain parts. The condition is attributed to different causes. Thus it may follow lymphangitis, in consequence of which the larger tubes are blocked, and the afferent vessels become therefore dilated. In other cases it is not preceded by marked inflam-

mation of the lymphatics, but there is considerable hypertrophy of the cellular tissue, and the vessels enlarge, forming a very free anastomosing network. Again, it is supposed that dilatation may arise from mere hypertrophy of lymphatic plexuses; or from paralysis of the coats of the vessels. Any obstruction from internal plugging or external pressure may lead to enlargement of the vessels, the circulation through which is thus impeded; and probably the obstruction may be occasionally seated in the glands. Lymphatic dilatation is most frequently met with in warm and moist climates.

When lymphangiectasis occurs on the surface of the body, it can be recognized by objective examination. Dilatation of the superficial lymphatics is generally observed on the inner side of the thigh, the sides of the belly, the scrotum, and the penis. It is characterized by vesicles like grains of sago, grouped regularly or irregularly (Curnow). Sometimes only ampullæ are formed, which are generally soft and painless. The vessels may rupture subcutaneously, forming vesicles containing a clear or milky fluid. They are also liable to rupture externally, or into various internal parts when situated internally, and it is only thus that the latter can be at all recognized clinically, the escaped chyle or lymph appearing in the stools or urine. Even superficial dilatation of the lymphatics has been not uncommonly mistaken for other conditions, such as hernia, abscesses, and strumous enlargement. The discharge of lymph confirms the diagnosis. If inflammation attacks dilated lymphatics, it tends to spread rapidly, and may prove fatal. The clinical characters of lymphatic growths and tumours do not call for consideration here. Congenital cystic formations connected with the lymphatics occur chiefly on the tongue, upper lip, and neck.

5. **Lymphorrhœa—Lymphorrhagia.**—By these terms is signified the discharge of lymph or chyle from the vessels or glands, either on the surface of the body or into some internal part, the amount varying much in different cases. This is sometimes of *traumatic* origin, and in rare cases it may occur from slight wounds, especially in the neighbourhood of joints, which is probably due to a constitutional defect—a *lymphorrhagic diathesis*, corresponding to the hæmorrhagic diathesis. (Bradley.) Usually traumatic lymphorrhœa results from wounds of the thoracic duct, of the larger lymphatic trunks, or of the glands. Idiopathic lymphorrhagia is generally due to previous dilatation of the vessels, which ultimately give way. A most interesting case has been reported by Dr. Cayley,* in which the receptaculum chyli gave way spontaneously as the result of previous extreme dilatation, and fatal peritonitis ensued. With regard to chyluria, it is supposed by some pathologists that this condition is due to the aggregation of *Filaria* in the kidneys or urinary tracts, which cause a rupture of the lymphatics, and an escape of their contents into the urinary passages.

When lymphorrhagia occurs on the surface of the body, the discharge of the lymph is the clinical sign of the condition. The amount of fluid which escapes varies considerably, ranging from an ounce to five or even ten pounds during the twenty-four hours. It also differs at

different times, and the flow has even been known to assume a periodic character, increasing during digestion. The fluid which escapes after injury may be clear and limpid lymph, or mixed with inflammatory products or blood. That which comes away in cases of rupture from dilatation of the vessels is more or less white and milky, like chyle, and it contains more or less fat. The quantity of fibrin present varies much, and therefore its power of spontaneous coagulation. When lymphorrhagia takes place internally, it can only be recognized by the presence of the fluid in the urine or fæces respectively; in the former case giving rise to chyluria, in the latter to fatty stools. Mr. Bradley has called attention to the probable origin of certain cases of hydrocele, hydrocephalus, pleuritic effusion, and ascites from a lymphorrhagia into the respective serous cavities. I have recently met with a case of ascites which seemed at any rate to be partly due to this cause. As proved by Dr. Cayley's case, the escape of chyle into the peritoneum may set up fatal inflammation. The general condition is more or less affected in cases of lymphorrhagia, in proportion to the amount of fluid lost.

6. Simple Glandular hypertrophy—Lymphadenoma—Hodgkin's disease—Adenie.—Hypertrophy of the absorbent glands is an important morbid condition, which occurs, as has been already pointed out, in one form of leucocythæmia, but which constitutes the main anatomical change in the affection known as *Hodgkin's disease*, to which attention will now be briefly directed.

ÆTIOLOGY AND PATHOLOGY.—Very little is positively known on this matter, but it is assumed that Hodgkin's disease is a primary affection of the lymphatic system, depending upon some special constitutional condition or diathesis, which has been named *lymphadenosis*. By some pathologists it is regarded as malignant, and is placed by Wilks between cancer and tubercle. In many cases the disease seems to begin without any obvious cause, but in others it evidently starts from some local irritation, and such irritation has probably been present in other instances where it has been too slight to attract attention. This complaint is said to be common among French soldiers, and has been attributed to the irritation of the stiff military stock. It may be associated with a distinct scrofulous habit. As regards *predisposing causes*, Hodgkin's disease is most common in early and late adult life; in males; and amongst the poor, its development being aided by bad food, insufficient clothing, cold and damp, and unfavourable hygienic conditions.

ANATOMICAL CHARACTERS.—The lymphatic glands more or less throughout the body present various degrees of enlargement. This is first observed usually in the neck, and especially in the sub-maxillary glands, but in most cases other groups are involved in succession, especially the axillary, inguinal, and mediastinal. The disease may, however, begin in other parts, even in internal glands, to which it may be mainly or almost entirely limited. The glands may increase until they attain a very large size, forming considerable masses or tumours. At first they are distinct, but gradually become fused into one growth. In exceptional cases they involve the skin. These glandular enlargements usually show no disposition whatever to suppurate, or to undergo

degeneration. Rarely caseous degeneration does take place, but this is due to an associated strumous diathesis. On section the enlarged glands are seen to be whitish or yellowish-grey. The consistence varies considerably, and the glands may be very soft, yielding a juice on pressure; or firm and dry. The distinction between their cortical and medullary portions becomes lost. Microscopic examination reveals that the enlargement is due to hypertrophy of the glandular tissue, the whole structure being converted gradually into lymph-cells, with a fine network of cellular tissue. In the firmer varieties there is more fibrous tissue.

In addition to the hypertrophy of the lymphatic glands just described, other organs in course of time present growths of a similar nature, especially the spleen, and less commonly the liver, lungs, kidneys, and alimentary canal. Even the canals of the bones may be filled with lymphoid cells. The heart is sometimes atrophied and fatty. Signs of inflammatory and other complications may be met with at the *post-mortem* examination.

SYMPTOMS.—When the affected glands in Hodgkin's disease are superficial, their enlargement is evident on objective examination, and their extension and growth can be observed. In the large majority of cases there is neither pain nor tenderness, but if the enlargement is very acute and rapid, sharp shooting pains may be complained of. When situated in internal cavities, the existence of lymphadenomatous growths can generally be made out by physical examination. Some of the most important symptoms result from pressure and irritation by the enlarged glands, these necessarily varying according to their position, and their relation to adjoining structures. Obstructive dyspnoea is often a marked symptom when the growth is situated within the chest. Along with the local signs of this disease, the constitution is obviously affected as a rule. This may occur before any local symptoms appear, but usually the general symptoms are gradually developed as the glands progressively enlarge, including emaciation; anæmia and its attendant phenomena, often combined with an appearance of serious illness; marked muscular weakness, the patient often tottering and trembling; and feeble circulation. More or less pyrexia is present in most cases, especially in young patients. Free perspirations are common, and the skin is pale and usually moist. Edema of the legs is a frequent symptom. The blood does not present any excess of white corpuscles, but is often very watery and wanting in its normal colour, the red corpuscles being markedly deficient. The patient is much depressed and low spirited, and attacks of syncope are not uncommon. Bronzing of the skin has been said to arise from enlarged retro-peritoneal glands, surrounding and compressing the solar plexus.

Unless death should occur from the local effects of the enlarged glands, the *course* of Hodgkin's disease is generally chronic and progressive. Occasionally it is very acute, attended with high fever, profuse perspiration, vomiting and purging, and mental wandering at times. The *termination* is generally fatal, and in most cases death occurs within two years, either from gradual asthenia and exhaustion; from the effects of pressure; rarely from hæmorrhage, owing to perforation of a blood-vessel; or from some intercurrent complication, such

as pneumonia, pleurisy, erysipelas, or Bright's disease. It must be remembered, however, that cases of extensive lymphadenoma may go on for many years, the system being apparently but little affected, and the patient enjoying fair or even good health. In some instances the glands may be much reduced in size by appropriate treatment; while in others they remain enlarged, but show no tendency to progressive increase.

7. Scrofulous or Tubercular disease.—In scrofulous subjects, especially children, one of the prominent clinical phenomena in many cases consists in chronic enlargement of the external lymphatic glands, especially those of the neck, there being a tendency to subsequent degeneration and breaking down of their structure, with unhealthy suppuration or caseation. In other cases the glands within the abdomen and chest are extensively affected. The enlargement was formerly considered as being due either to an unhealthy chronic inflammation; or to a deposit of tubercle. Now, however, it is known to be the result of hyperplasia of the lymphatic elements. These have a very low vitality, and are liable to become speedily disorganized and caseous; they may finally dry up and calcify, or go on to unhealthy suppuration, forming chronic abscesses, which subsequently burst or destroy neighbouring tissues. When the affected glands are superficial, they are easily recognized. In the chest they constitute the disease named *bronchial phthisis*; and, in addition to giving rise to the signs of a mediastinal tumour, the glands are liable to soften and to form excavations, ultimately involving the lungs, or opening into the trachea or a bronchus, into the pleura, or into one of the great vessels. If they communicate with the air-passages, there is much expectoration of muco-purulent or purulent matter, as well as in many cases of blood, caseous matter, or calcarous particles. When the mesenteric glands are implicated—*tabes mesenterica*—they may be felt separately or as an agglomerated mass, and often give rise to symptoms of peritoneal irritation or inflammation; as well as to flatulence, colicky pains, and various digestive disturbances. Owing to the accumulation of flatus, the abdomen is generally much distended. Appetite may be excessive, deficient or lost, or capricious. The bowels are frequently irregular, being either constipated or relaxed, the stools being also unhealthy. Uncontrollable diarrhoea is present if the intestines are ulcerated. In exceptional instances the softened glands rupture into the peritoneum or intestines. This variety of glandular disease is usually attended with considerable constitutional disorder, indicated by emaciation, debility, and fever tending towards a hectic type. The loss of flesh is frequently extreme when the lacteal glands are involved; and it is also very marked in bronchial phthisis, if the glands break down. In children, in whom this complaint is much the most common, there is in many cases no evidence of tubercle in other organs; but in adults the lungs or other structures are generally implicated. Recovery may be brought about even when the glands throughout the body have been extensively affected, many of them perhaps remaining as calcified masses.

8. Albuminoid disease.—The absorbent glands are often the seat of albuminoid disease. They are then very firm and small; on section

presenting the characteristic pale, homogeneous, waxy appearance. In the abdomen they can be felt as little hard masses, separate, and readily movable. The constitutional symptoms are those of the general disease.

9. **Cancer.**—As a secondary deposit, cancer is very liable to implicate the absorbent glands in the neighbourhood of any structure which may be affected with this disease. It may also commence in them primarily. All forms are met with; and large, hard, nodulated tumours are often formed. The clinical phenomena are mainly those due to the presence of the tumour; with evidences of the cancerous cachexia. The glands are generally very painful and tender.

GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. **DIAGNOSIS.**—As regards the lymphatics, sufficient has been already said to indicate the data upon which the diagnosis of their several affections is founded. In forming a diagnosis of glandular diseases, special attention must be paid to the constitutional condition; and to the physical characters presented by the glands. The main difficulty lies in determining the existence of disease of the glands in internal cavities; and in making out their exact condition. Glandular disease must always be borne in mind as a prominent cause of wasting in children, and especially affections of the mesenteric or bronchial glands.

2. **PROGNOSIS.**—This will depend on the nature and cause of the disease present; the state of the constitution; the situation and extent of glands which are affected; and the changes which they undergo. Acute inflammatory affections may prove very serious. In internal cavities enlarged glands, by their mere pressure or destructive effects, are liable to give rise to serious mischief. Extensive glandular disease in children, particularly when the mesenteric glands are involved, is very dangerous.

3. **TREATMENT.**—*a.* In *acute lymphangitis* and *adenitis* the principles of treatment are to remove any cause of the inflammation; to keep the affected part at rest; and to use warm fomentations and poultices freely. Sometimes leeches may be applied with advantage. Should suppuration be set up, this must be managed on ordinary principles. *b.* In *chronic* affections connected with the absorbent system, constitutional treatment is often of the first importance, especially when the glands are involved. This must be adapted to the nature of the disease, but the measures which are generally serviceable include the administration of good nutritious diet, with plenty of milk; attention to all hygienic matters, with change of air, especially to the sea-side, sea-bathing being often very beneficial; regulation of the digestive functions; and the use of cod-liver oil, quinine, iron in some form, especially syrup of the iodide or phosphate, and other tonics. Iodide of potassium and liquor potassæ have been supposed to influence the size of the glands. It is the custom to use various external applications over enlarged glands, with the view of diminishing their size, especially ointments of iodine or iodide of lead; tincture of iodine painted over the skin; lotions of iodine and iodide of potassium; spirit lotions, or

those containing nitrate of ammonia ; or sea-weed poultices or fomentations. In many instances undoubtedly much good may be thus effected, but certainly it is necessary to be careful in employing strong applications, such as those of iodine, and also in practising violent friction, as injurious irritation and inflammation may thus be induced. Gentle friction with some simple oleaginous substance is frequently beneficial. Should abscesses form, they must be treated by poulticing and incisions. Symptoms due to enlarged glands in internal cavities must be attended to as they arise. Some practitioners recommend irritant injections into the substance of chronically enlarged glands. Extirpation has been occasionally practised, but this is not a desirable mode of treatment. The administration of phosphorus may diminish the size of the glands in Hodgkin's disease, but is for other reasons not to be recommended. The constant current has been employed in some cases with success. For the chronic conditions connected with the vessels, such as dilatation or lymphorrhagia, careful bandaging is useful, or elastic pressure may be employed ; kneading may help to remove lymphatic œdema.

CHAPTER XLVIII.

DISEASES OF THE THYROID GLAND—BRONCHOCELE—GOITRE.

THE cases of disease affecting the thyroid body which come under the notice of the physician belong to two distinct groups, which it will be necessary to notice separately.

1. In certain districts enlargement of the thyroid gland—**bronchocele** or **goitre**—prevails as an endemic disease. It is particularly observed at the base of high mountains. In this country goitre prevails especially in Derbyshire—hence named “Derbyshire neck ;” and in certain parts of Yorkshire, Sussex, Hants, and Nottinghamshire. It has been attributed to various meteorological and other causes, but the mass of evidence goes to prove distinctly that it is due to impregnation of the drinking water with excess of lime and magnesia salts, these salts having been dissolved in the percolation of the water through the geological strata containing them. The disease is observed most commonly in females ; and is rare before puberty, though it has been known to be congenital.

ANATOMICAL CHARACTERS.—The degree of enlargement varies considerably, and the gland may attain very great dimensions. It begins in the isthmus, or in one lobe, especially the right, but ultimately usually involves the entire organ. The shape of the gland is generally altered, the distinction of its several parts being lost, but this is not always the case. At first the tumour is soft, but gradually becomes firmer, and may ultimately be exceedingly hard. In the early stage there is simply hypertrophy of the gland—*simple bronchocele*—with the forma-

tion of a glutinous, ropy, colloid fluid in its cells; afterwards the blood-vessels increase in number and become dilated, while numerous cysts form—*cystic bronchocele*—containing either the gelatinous material or a bloody-looking fluid. Ultimately calcareous matter is deposited, and the gland may be converted into a calcified capsule, enclosing cysts, various kinds of fluid, and calcareous aggregations. Inflammation and suppuration or ulceration may arise, altering materially the characters of the enlargement.

SYMPTOMS.—The thyroid gland presents an obvious swelling, varying in its size and other characters; and the whole or part of the gland being involved. It may compress the neighbouring structures, and lead to serious dyspnoea, dysphagia, or interference with the circulation in the neck. The general system is usually below par, there being often much debility and anæmia. In some valley-districts bronchocele is associated with *cretinism*, a condition characterized by marked mental deficiency, with atrophy of the brain; as well as by bodily deformity.

TREATMENT.—In this form of bronchocele the principles of treatment are to change the residence; to avoid drinking the impregnated water; to employ iodine both internally and externally; and to improve the condition of the system by means of iron. Iodine has gained the reputation of being almost a specific for goitre, and the best mode of administration is to give the tincture in small doses with iodide of potassium, freely diluted. Iodide of iron is also very useful. Externally applications of the tincture of iodine, iodine ointment, or ointment of iodide of mercury are chiefly employed. Pressure may be beneficial in reducing the enlargement. If this treatment is unsuccessful, surgical interference is advocated, especially injection of the gland with some irritant, such as diluted iodine or tincture of steel; the passage of a seton or wire through the tumour; ligature of the thyroid arteries; or, as a final resource, extirpation of the enlarged organ.

2. **Exophthalmic goitre—Graves's or Basedow's disease.**—This is a highly interesting complaint, characterized by palpitation of the heart; marked pulsation in the vessels of the neck and head; enlargement and usually pulsation of the thyroid gland; and prominence of the eyeballs or exophthalmos. It is observed by far most commonly in young women from twenty to thirty years of age, but may be met with in males, who are usually somewhat advanced in age. Almost always, but not invariably, the condition is associated in females with marked anæmia and menstrual derangement. The patients are often of nervous temperament, and the complaint may be directly traceable to some powerful nervous disturbance. Pathologically exophthalmic goitre is believed to be the result of paralysis of the vaso-motor nerves supplying the vessels of the thyroid gland, and of the head and neck; and of undue stimulation of the accelerating nerves of the heart. The enlargement of the thyroid, which is not usually very great, is due mainly to dilatation of its vessels, partly to serous infiltration of its tissues, and after a time to hypertrophy; very rarely do cysts form. The exophthalmos is supposed to result either from the eyes being pushed forward, owing to the dilated vessels and increased vascularity, oedema, and probably hyperplasia of the fat behind them; to contrac-

tion of the muscular tissue in the membrane which covers the sphenomaxillary fissure ; or to a combination of these causes. There is no satisfactory evidence in support of the notion that the nervous disturbance is due to any obvious change in the lower cervical ganglia of the sympathetic, as has been suggested, although increase in the connective tissue and diminution of the nerve-cells in these ganglia have been described.

SYMPTOMS.—As a rule the subjects of exophthalmic goitre are very anæmic or chlorotic, and they often become low-spirited or irritable before the actual symptoms appear. Palpitation is usually noticed for some time before the other characteristic phenomena, and these generally come on very gradually. The enlarged thyroid feels soft and elastic, while it pulsates or presents a peculiar thrilly sensation ; and frequently a hæmic murmur is heard over it. The degree of enlargement varies in different cases, and the gland is usually unequally affected. The pulsation may even be visible at a distance. The degree of exophthalmos also varies, but it may become so great that the eye-balls project considerably, so that the eyelids cannot cover them ; hence grave destructive changes are liable to be set up in these organs, due to inflammation and ulceration. Their movements may be much impaired, and often a certain degree of impairment of the co-ordination between their movements and those of the eyelids is observed, so that when the eyes are quickly cast down, the eyelids do not follow them, and the sclerotic is visible below the upper eyelid. Vision is generally unaffected. The exophthalmos is sometimes preceded by a spasmodic contraction of the levatores palpebrarum, which is said to be very characteristic. The cardiac action is often very rapid, and may be irregular. A basic murmur is not uncommon, due to the excited cardiac action, and the anæmic condition of the blood. The carotid arteries are frequently seen to throb violently ; and they are sometimes dilated. A murmur may be audible in them and in the subclavians. The increased pulsation is evident even in the smaller arteries. Uncomfortable sensations of throbbing and fulness in the head, giddiness, and headache are often complained of ; while the face is liable to flush. Patients suffering from this affection often feel weak ; they are liable to free perspirations ; and their temperature is frequently raised. They not uncommonly suffer from dyspeptic symptoms. Among other phenomena noticed may be difficulty of breathing, hoarseness, or aphonia, due to the enlarged thyroid ; and a sensation of fulness and throbbing in the throat. The characteristic symptoms are usually much increased by exertion and emotion. Many cases improve or recover under proper treatment, but the course and duration of exophthalmic goitre are very variable. Death may result from the consequences of gradual dilatation and weakening of the heart ; from general wasting ; from interference with respiration ; or from intercurrent disease.

TREATMENT.—In cases of exophthalmic goitre the treatment must be mainly directed to the general state, iron, quinine, and other tonics, with nutritious digestible food, careful attention to hygienic conditions, especially as regards fresh air, and moderate exercise being the chief remedies required. Digitalis is useful, on account of its influence upon

the heart; and belladonna is also decidedly efficacious in some cases, in combination with iron. Ergot has been recommended; and also galvanism of the sympathetic in the neck. Care must be taken to prevent the eyes from becoming injured, and with this object a shade may be worn; or the eyelids may be closed by means of a light bandage, if necessary.

CHAPTER XLIX.

DISEASES OF THE NERVOUS SYSTEM.

CLINICAL CHARACTERS.

THE clinical investigation of nervous affections is frequently very difficult, and there is no class of diseases in connection with which a definite and systematic mode of examination is more requisite. Further, it is highly important to have a clear notion as to the anatomy and physiology of the nervous system, particularly as to the functions of the different parts of the central organs, and the distribution and functions of the nerves. The clinical phenomena which may be associated with the nervous system will now only be enumerated, but some of the most important of these phenomena will be hereafter discussed in detail. They may be indicated as follows:—

1. **Morbid sensations in the head**, including headache, tenderness, sense of weight or heaviness, throbbing, heat, vertigo or dizziness.

2. **Morbid sensations connected with the spine**, chiefly pain, tenderness, burning, or a peculiar sense of tightness round the body, as if it were encircled by a tight cord extending from the spine. As regards spinal pain, it is important to notice whether it is felt all along the spine or is localized; if it is constant or paroxysmal; if it shoots in any direction; and in some cases how it is influenced by walking, by movements of the spinal column, by percussion or kneading along the spine, by concussion of the heels, and by the passage of ice or of a hot sponge along the spine.

3. **Mental disturbance**. It is impossible to indicate here all the numerous derangements coming under this head, especially as observed in cases of insanity, but their general character may be gathered from the following summary:—*a.* Impaired consciousness, from mere stupor to absolute coma. *b.* Disorder of the intellectual faculties, including perception and apprehension, thought, reasoning, judgment, and memory. Under this would come the various forms of delirium, mental confusion, delusions, illusions, and hallucinations; or there may be mere failure or complete loss of one or all of the mental powers. In some cases the mental faculties are unnaturally acute. *c.* Alterations in the moral feelings and actions, manner of behaviour, disposition, affections, spirits, and temper. *d.* Emotional disorder, as evidenced by the emotions being unduly excited or the reverse. *e.* Disturbance of speech as an intellectual act—*aphasia*. *f.* Disorders affecting sleep,

including somnolence, insomnia, uneasy sleep with unpleasant dreams, somnambulism, and somniloquism.

4. Subjective disturbances of the special senses.—a. Vision. The chief derangements of vision are photophobia or undue sensibility to light; photopsia or subjective sensations of flashes of light, of iridic colours, sparks, muscæ volitantes or spectra; defective sight, either dimness of vision to complete blindness, double vision or diplopia, hemiopia, part of the field of vision being lost, or altered perception of colours. *b. Hearing* may be affected, as shown by intolerance of sound; different degrees of deafness; or tinnitus aurium. *c. Smell* or *taste* may also be impaired or lost; unduly sensitive; or perverted.

5. Alterations in general sensation and tactile sensibility.—These comprehend:—*a. Hyperæsthesia*, or undue sensibility to touch; and *dysæsthesia* or *hyperalgesia*, or undue sensibility to pain. *b.* The opposite condition of *hypæsthesia*, *anæsthesia*, or *analgesia*. There may be a sensation of something intervening between the skin and any object touched; or inability to distinguish the characters of the surface, or the form of an object. *c.* Various kinds of pain and tenderness felt in different parts of the body. *d.* *Paræsthesiæ* or perverted sensations, such as numbness, tickling, itching, formication or creeping, heat or cold, pricking, tingling, aura epileptica.

6. Impairment of the muscular sense.—This deviation probably exists in certain forms of disease, and is evidenced by a difficulty in realizing weight and resistance, or in performing certain muscular acts without looking and paying attention to them; or by a want of consciousness as to whether different muscles are contracted or not.

7. Alterations affecting motility.—These are of the greatest importance, and comprise:—*a.* General restlessness and jactitation. *b.* Abnormal attitudes or movements while lying, sitting, standing, or moving, such as being coiled up; boring the head into the pillow; a disposition to stagger or fall, to advance irresistibly or run, to rotate on an axis, or to proceed in a circle. *c.* Evidences of muscular weakness, in the way of general trembling; local tremors; or unsteadiness of a limb when raised. *d.* Signs of undue muscular irritability, viz., twitchings; subsultus tendinum; rigidity; clonic or tonic spasms; convulsive movements; and cramps or painful spasms. As varieties of symptoms due to spasmodic movements should be mentioned strabismus; rolling about of the eyes; champing of the jaws; grinding of the teeth; and trismus or lock-jaw. *e.* Paralysis, either general, hemiplegic, paralytic, or local. *f.* Loss of power in co-ordinating muscles for the performance of various acts. *g.* Automatic involuntary movements, such as those observed in chorea. *h.* Deficient or excessive reflex irritability. *i.* Cataleptic fixity of a limb; or slow purposeless movements of flexion and extension.

8. Changes in vascular supply, nutrition, and secretion.—The influence of the nervous system on these processes is well known, and it will suffice to mention here as illustrations, the change in temperature and the wasting, with tendency to bed-sores, often observed in paralyzed parts; the disorders of nutrition and secretion which frequently accompany neuralgia; and the influence of nervous affections on the secretion of tears saliva, or urine.

9. There are some important **extrinsic** symptoms often associated with nervous diseases, namely, those referable to the stomach, bladder, bowels, and sexual organs, many of them being due to paralysis. They include nausea and vomiting ; obstinate constipation, accumulation of fæces in the rectum, involuntary or unconscious defæcation ; irritability of the bladder, retention or incontinence of urine, involuntary micturition ; diminution or loss of sexual inclination or power, undue sexual excitability, or constant priapism.

PHYSICAL EXAMINATION.

Objective modes of examination are highly important in the investigation of nervous diseases, and the following outline may serve to indicate the information to be thus obtained :—

A. Examination of the head as to size and shape ; state of the fontanelles ; or signs of tumours.

B. Examination of the spinal column as to shape, or evidences of a tumour.

C. Tests of tactile sensibility.—In order to determine the state of cutaneous sensibility, the effects must be noted of a slight touch or pressure ; of tickling, pinching, or pricking the skin ; of using Weber's, Sieveking's, Jaccoud's, or some other kind of *æsthesiometer* ; and of electricity. Weber's instrument consists essentially of a pair of compasses, the points of which are covered with sealing-wax, and it is noted what is the shortest distance apart at which these can be recognized as separate points of touch, an approximate idea being thus gained as to the degree of sensibility of a particular part.

D. Tests applied to muscles.—*a.* When any muscles are supposed to be paralyzed, the patient should be desired to attempt to perform different actions which would bring the affected muscles into play, and thus it can be observed whether they are really paralyzed, and to what degree ; it being noted whether these actions can be performed at all, or if they are slowly produced and deficient in power. An instrument named the *dynamometer* has been invented by Duchenne, for the purpose of measuring, and recording accurately the strength of the hand-grasp ; and also of measuring the force of traction which can be exerted by other groups of muscles. *b.* When there is impairment or loss of co-ordinating power, the involved muscles should also be tested in an appropriate manner. *c.* A matter of frequent importance is to determine whether muscular irritability is retained or lost, as well as the degree of facility with which it is excited, and the force with which the muscles act when thus irritated. This is accomplished by employing some mechanical irritation, such as pressure, percussion, or drawing the finger along the muscles ; but especially by electricity. In many cases it is useful to note the effect of slight irritation of the skin in exciting reflex actions, as, for instance, tickling the soles of the feet in paraplegia.

E. Uses of Electricity.—Electricity has now come to occupy a most prominent position in the diagnosis, prognosis, and treatment of affections of the nervous system. It is, therefore, desirable to give here

a brief general summary of the diagnostic aids which it affords. A satisfactory knowledge of the many forms of apparatus employed, and of the modes of using them, can only be obtained from practical demonstration, and it must suffice to state that one of three kinds of electricity is made use of in constructing the different appliances, viz. :—

1. *Frictional, static, or Franklinic.* 2. *Galvanic or Voltaic*, which may be used either as a *continuous* or an *interrupted* current. 3. *Magneto-electric or Faradic*, the so-called *induced* current, from which only an *interrupted* current can be produced. The main diagnostic uses of these several forms of electricity is indicated in the following remarks :—

(1.) In a case of supposed *shamming* of unconsciousness or “a fit,” much light may often be thrown upon its nature by giving the patient a tolerably strong shock, or by touching parts of the face with one of the handles of an electric apparatus. Even where there is real unconsciousness, as in cases of alcoholic poisoning, its degree may be made out by noticing the effect of cautiously touching one of the features.

(2.) The most important use of electricity in diagnosis is to test :—

- a. The *electric irritability* or *contractility* of muscles, that is, the readiness with which they are excited to action. b. The *force* with which they contract. Either faradization or interrupted galvanism may be employed, and for determining the irritability of muscles a very weak current is necessary ; for testing the force, a strong one must be used. It commonly happens in cases of paralysis that the irritability of the affected muscles is increased, so that they are brought into action by a much weaker current than the muscles which are healthy ; while, at the same time, the force of contraction is greatly diminished, but little action being excited even by the strongest current. The information to be derived from this application of electricity is twofold :—(i.) It may reveal whether a part said to be paralyzed is really in this condition or not, which is especially important in cases of malingering or hysteria, and after railway accidents. For instance, should it be affirmed that one side or one limb is paralyzed, if it is found that in the corresponding muscles irritability is excessive as compared with the healthy side, while the force of contraction under a powerful current is greatly diminished, this affords certain evidence that paralysis exists. No positive conclusion can be arrived at if the irritability and force are normal, for this may be the case in true paralysis.
- (ii.) Supposing a part to be really paralyzed, electricity will reveal the relation of the muscles to the portion of the nerve-centre from which the nerves which supply them come. If the electric irritability is permanently lost or more or less impaired, it shows either that the part of the nerve-centre from which the nerve originates is itself disorganized ; or that the nerve in some part of its course is destroyed completely or partially ; or that there is some condition in the muscles themselves, or perhaps in the minute branches of the nerve distributed to them, which prevents them from acting under electricity, as is especially the case in paralysis from lead-poisoning, and in certain local forms resulting from exposure to cold. In paralyzed muscles the electric irritability may be temporarily impaired from mere disuse, but a few applications of the current will then speedily restore it. Should the contractility be normal, this proves that there is no loss of continuity in the nerve supplying the

muscles affected, and that the portion of the nerve-centre from which this arises is not destroyed. For instance, if the facial nerve is paralyzed from cerebral disease, which as a rule does not affect its root of origin, the electric irritability of the facial muscles is but rarely impaired; but if the nerve is involved in some part of its course, as from disease of the temporal bone, then the irritability is always weakened or lost. In hemiplegia from cerebral disease, should the irritability of the affected limbs be permanently impaired, it proves that the disease has extended to those portions of the spinal cord from which their nerves actually arise. Again, in paralysis from disease of the spinal cord, if the contractility is normal, this shows that the seat of the disease is situated higher up than the origin of the nerves, and has not extended to this point, and *vice versa*. Dr. Marshall Hall used the term "spinal paralysis" to signify complete separation of a muscle from the spinal cord, whatever condition this may be due to. In certain forms of paralysis, viz., that due to lead or local exposure to cold, as well as in anomalous cases of atrophic paralysis of the limbs, it is found that the electric irritability of the muscles is increased to a slowly-interrupted galvanic current, while it is diminished or extinct to a rapid current and to faradization. By the employment of the slow current improvement may be brought about, and as this takes place the undue irritability diminishes, while it improves to the rapid current and to faradization. Not uncommonly, after sudden paralysis muscular contractility becomes excessive after a few days; this indicates some irritation set up in connection with the brain or spinal cord, consequent upon increased vascularity, inflammation, or some other morbid condition.

(3.) Another use of electricity is to *test the sensation* which it produces in the skin, muscles, nerves, and nerve-centres. Reference need only be made here to the first two. The general *cutaneous sensibility* to electricity is often increased in hysterical and nervous persons. If it is excessive on one side, this becomes a sign of central irritation. In general shock and some cases of hysteria, trance, and similar conditions, the electric sensibility of the skin is lessened or absent; as well as in some very rare cases of chronic central disease. It is often locally lost or impaired in connection with paralysis of a sensory or mixed nerve. *Muscular sensibility* is as a rule proportionate to the electric contractility. Occasionally, however, sensibility is lessened or extinct when contractility is normal, as in some cases of hysteria; and the reverse has been observed in certain instances of lead-palsy. Sometimes also there is increased muscular sensibility while contractility is normal, as in myalgia and rare cases of central disease. If contractility, with muscular and cutaneous sensibility, are all impaired in a limb or in one half of the body, the condition is one of shock or of extensive cerebro-spinal lesion.

F. When a limb is paralyzed, the **state of nutrition** of its tissues must be noted, especially that of the muscles, by feeling them, and by making circular measurements, for which a special apparatus has been invented by Dr. Russell Reynolds. It should also be observed whether there is any local change in **temperature**; or in the characters of the **pulse**.

G. Examination directed to the special senses.—It may be

requisite to test the sense of hearing, taste, or smell ; but the most important matter coming under this head is examination directed to the eye and to vision. This comprehends:—(i.) *Examination of the pupils*, observing whether both are contracted or dilated ; if they are equal or unequal ; and if they act properly under light. (ii.) *Testing the sight* in various ways, particular attention being paid to the *field of vision* in all directions. (iii.) *Examination with the ophthalmoscope*.—This instrument has now come to occupy a most important position as a mode of investigation of diseases of the nervous system, and Dr. Hughlings Jackson has specially insisted upon the importance of ophthalmoscopic examination as a routine measure in these affections. For a full account of this subject, and of the various kinds of apparatus employed, with the methods of using them, reference must be made to special treatises, the valuable work on “Medical Ophthalmoscopy,” by Dr. Gowers, being the most recent. It is, however, by practical demonstration that the use of the ophthalmoscope is best learnt, and considerable personal practice with the instrument is required before it can be satisfactorily employed. In the succeeding remarks a brief description will be given of the morbid appearances which may be presented, the structures to which attention must be directed in the examination being the optic disc, blood-vessels, retina, and choroid. At the outset it must be remarked that the normal amount of vascularity is subject to great variations, and therefore but little importance should be attached to slight alterations in this respect, unless they are changing or unilateral.

α. *Hyperæmia*.—This may be limited to the vessels of the disc or retina, or involve both sets. It is characterized by more or less increased redness, with enlargement of the vessels and apparent increase in their number, many radiating from the disc, and some appearing to be tortuous or varicose, there being in some cases minute dark-red spots, due to little “kinks” in the vessels. Pulsation in the arteries is often unusually distinct, especially on lightly pressing the eye-balls. Slight œdema of the disc may follow, dimming the edge, and veiling its surface. There may be subjective symptoms of dimness of vision, heaviness about the eyes, flashes of light, or iridic colours. The encephalic conditions with which hyperæmia may be associated are congestion ; acute or chronic inflammation, especially meningeal ; and tumours. It may exist as such ; but is more frequently the first stage of an acute inflammation, especially when due to a tumour. β.

Anæmia.—This condition may be persistent, as in general anæmia ; or transitory, as in vascular spasm. As a rule the disc, retina, and choroid are affected. There is pallor, with emptiness and shrinking of the vessels. It may be attended with temporary blindness, flashes of light or *muscæ volitantes*, and general weakness of vision. The local causes are vascular spasm and embolism. Anæmia has been noticed in epilepsy and acute uræmia. γ. *Œdema of the disc*.—Most frequently accompanying other conditions, viz., hyperæmia, ischæmia, but especially neuritis, in rare instances œdema exists alone. δ. *Ischæmia of the disc—Choked disc* (Allbutt). There is still much doubt and discussion as to the real significance of the condition thus named. By one set of authorities it is regarded as originating in congestion, in consequence of some increased intra-cranial pressure, which obstructs

and prevents the return of the blood from the eye through the ophthalmic vein to the cavernous sinus. Von Graefe advanced the view that ischæmia is due to "obstruction at the cavernous sinus, with concurrent action of the sclerotic ring." More recently it has been attributed to the pressure of fluid driven down into the subvaginal space around the optic nerve, and compressing the latter at the terminal *cul-de-sac*, so that the return of venous blood is impeded. This space is continuous with the subarachnoid space around the brain, and any increase of intra-cranial pressure or of subarachnoid fluid causes distension of the sheath around the nerve. Manz has endeavoured to prove this by experiments on animals. On the other hand, several of the highest authorities in ophthalmoscopy deny that this is the mode of origin of ischæmia, and consider that it is really a form of neuritis. Dr. Hughlings Jackson and others maintain that this is set up in a reflex manner, as the result of some irritation in the brain, and this reflex influence has been supposed to be conveyed through the vaso-motor nerves. Schmidt found experimentally that the liquid in the sheath around the optic nerve passes into lymph-spaces in the nerve at the lamina cribrosa, and he suggested that neuritis is set up by the influence, perhaps irritation, of fluid driven in by intra-cranial pressure. Others hold that the so-called ischæmia is always a descending neuritis, the inflammation being propagated directly from the brain along the trunk of the optic nerve. When advanced, the appearances in ischæmia are those of intense congestion and inflammation, with hæmorrhages. The disc is much swollen and prominent, generally rising steeply on one side and sinking gradually on the other, while the margin is obscured by infiltration and excessive vascularity, the latter giving it a mossy look, owing to the great increase in the number of capillaries. The colour may be deep-red, but is often a mixture of dirty grey and red, from the mixing of exudation with distended capillaries and minute extravasations. The nerve-fibres are somewhat swollen, less transparent than in health, so that the papillary region looks more coarsely fibrous. Cell and nuclear proliferation takes place in the connective tissue between the bundles of nerve-fibres and around the vessels. The retina is only altered immediately around the disc, being opaque, and its veins being enlarged, sometimes with streaks of exudation along the larger of them. Some nerve-fibres are disintegrated. The trunk of the optic nerve is unaffected. This state frequently exists to a marked degree without any disturbance of central vision. The causes of ischæmia are meningitis, tumour, hydrocephalus, and caries of the sphenoid bone.

Descending optic neuritis.—This signifies inflammation extending along the optic nerve from within the cranium, the extension probably taking place chiefly along its connective-tissue. Hence the optic trunk itself is involved, and the morbid ophthalmoscopic appearances are chiefly confined to the disc, occasionally involving the adjacent retina. The ophthalmoscopic distinctions from ischæmia are thus described:—The disc is less swollen, and does not present the steep, one-sided elevation; the main trunks of the vessels are chiefly enlarged and tortuous, and there is not the great increase in number of the minute branches and capillaries observed in ischæmia; the colour is less intense and more uniform, with more opacity, and these appearances extend further

into the retina; there is often a "woolly" aspect, probably due to oedema. Numerous small hæmorrhages frequently occur, which leave white spots. The intimate changes chiefly affect the connective-tissue, which undergoes proliferation, the nerve-fibres being subsequently disintegrated and wasted. A variety has been described as *perineuritis*, in which the outer neurilemma is most affected, the appearances being visible mainly in the margin of the papilla, and extending more widely into the retina. 9. *Chronic optic neuritis*.—Here there is an early stage of redness of the disc, with in some cases hæmorrhages and slight effusions, followed by consecutive atrophy, the vessels gradually contracting and disappearing. n. *Retinitis*.—Very rarely resulting from cerebral disease, this is characterized at first by hyperæmia of the disc and retina, followed by silvery patches of exudation upon the latter. The entire retina is probably never affected from cerebral disease. The intra-cranial causes of all the varieties of optic neuritis are meningitis and cerebritis, in whatever way these may have been set up. The inflammation must be contiguous to the nerve, and the latter is more likely to be affected if the morbid process is severe or prolonged. Tumours and other morbid conditions may give rise to neuritis, but only indirectly, by first exciting inflammation of the cerebral structures. Chronic neuritis is said to be connected with abuse of tobacco, general paralysis, and locomotor ataxy. 6. *Atrophy of the disc*.—Two forms of atrophy are recognized, the *simple*, *progressive*, or *primary*; and the *consecutive*, which is secondary to ischæmia or neuritis. Dr. Hughlings Jackson distinguishes between them by the raggedness of the edges, and blurring of the outline in the consecutive form; by the clean-cut even rim, and more brilliant appearance in the primary form. Dr. Allbutt, however, considers that the condition described as simple atrophy often succeeds chronic neuritis, and that the ragged and irregular form is only transitional, gradual changes taking place in the products of inflammation, which are finally entirely removed. True primary atrophy may result from destruction of the fibres in the course of the optic nerve, so as to sever their distal ends from their central attachment, as by pressure of a tumour or inflammatory exudation; disease at the root of the nerve in the centres of vision; progressive sclerosis extending along its trunk; or failure of nutrition from degeneration of arteries or embolism. The ultimate appearances observed in atrophy are that the disc becomes white, glistening, and more or less cupped; the smaller vessels fade away; the connective-tissue is increased; and the nerve-elements disappear.

H. There is a peculiar tendency among **malingerers** to sham nervous affections, and it sometimes requires considerable ingenuity to detect the imposture. In any case where anomalous nervous symptoms are complained of, without any objective signs, malingering should be suspected, and the patient should be closely watched, without letting it appear that this is being done. The tests to be applied will, of course, vary in different cases, but as illustrations of such tests may be mentioned the use of chloroform; various methods of detecting shammed fits, as by putting snuff under the nose, applying heat or cold suddenly, or pressing with the nail under the matrix of the thumb-nail; supporting a supposed paralyzed limb in an extended position, and

letting it fall suddenly ; pricking unexpectedly a part stated to be anæsthetic, while the patient is not looking ; and the use of strong electricity.

I. In all cases of cerebral disorder it is of great importance to examine carefully the heart and vessels ; and also to test the urine.

CHAPTER L.

ON CERTAIN HEAD-SYMPTOMS.

I. HEADACHE OR CEPHALALGIA.

ÆTIOLOGY.—The causes of headache are very numerous, and terms are often prefixed indicating its mode of origin, such as congestive, plethoric, anæmic, organic, nervous or idiopathic, neuralgic, dyspeptic, or bilious. The *pathological conditions* which may give rise to this symptom are :—1. Disturbance in connection with the *cerebral circulation*, including congestion, especially that due to general plethora, increased cardiac action, vaso-motor paralysis of the cerebral vessels (by inducing which many remote causes excite headache), or venous obstruction ; deficiency of blood ; or an abnormal condition of this fluid, particularly when it is hydræmic, imperfectly acrated, or impregnated with various deleterious ingredients. 2. *Injuries or organic diseases of the brain or its membranes*, e.g., meningitis, cerebritis, abscess, tumour, softening. 3. *Disease of the cranial bones* or their sinuses ; or of the structures forming the *scalp*. 4. *Neuralgia*, affecting the nerves either within or outside the skull. The chief *remote* causes which may excite headache, by giving rise to certain of the conditions mentioned above, include all those which induce general plethora or anæmia ; cardiac or pulmonary diseases, or severe fits of coughing ; affections of the stomach, bowels, and liver ; renal and cutaneous diseases ; fevers and acute inflammations ; ague or mere malarial influence ; gout and rheumatism ; uterine disorders ; hysteria ; various causes which exhaust or depress the nervous and vital energy, such as sedentary habits, deficient ventilation, over-work in confined rooms, undue mental exertion, depressing emotions, exposure to the hot sun, particularly when fatigued, loss of sleep ; over-lactation, venereal excesses and masturbation ; and abuse of coffee, tea, alcohol, tobacco, opium, and various other drugs which affect the brain. Some individuals are much more subject to headache than others, and especially delicate females of a nervous temperament.

CHARACTERS.—The points concerning which it may be necessary to inquire with reference to headache are :—*a.* Its mode of onset ; and if it is brought on by any obvious cause. *b.* Whether it is constant, or only felt at intervals. *c.* Its exact situation, whether general, unilateral, frontal, occipital, over the vertex, or localized to a particular spot ; and also if it seems to be superficial or deep. *d.* Its characters, the chief

varieties being heavy, dull, aching ; throbbing ; shooting or darting ; boring ; oppressive ; accompanied with a sense of fulness, as if the head were going to burst ; or with a feeling of great heat. *e.* Its intensity, and if this is variable or not. *f.* The effects of movement and change of posture, especially of moving or hanging down the head ; of muscular exertion ; of coughing ; of light or sound ; of firm pressure over the whole head or any part of it ; of taking food or stimulants ; or of pressure on the carotid vessels. *g.* If it is accompanied with soreness and tenderness, either over the scalp generally, or over any particular spot.

II. VERTIGO—GIDDINESS.

There are two distinct forms of giddiness, so far as the sensations of the patients are concerned, in the one the feeling being that of motion of the body, and as if it were impelled in different directions, accompanied with a tendency to fall and unsteadiness of gait ; in the other extraneous objects appearing to move and to assume abnormal positions. The sensation is often described as “dizziness” or “swimmings.” It varies much in intensity, and may be constant or paroxysmal. In many cases it is only or chiefly felt on movement or in certain positions, especially on bending the head downwards. It may be worse in the sitting, standing, or recumbent posture in different cases ; while closing the eyes, or staring fixedly for a time at an object, has often a marked influence on vertigo, either aggravating or relieving the sensation. Occasionally an attack comes on during sleep, awakening the patient. Commonly other head-symptoms are present ; as well as disturbances of the special senses.

ÆTIOLOGY.—Vertigo is directly due to some condition in the brain, which either causes it to receive wrong impressions from the special senses, especially that of sight ; or which interferes with the power of co-ordinating the muscles for movement. Probably there is in all cases some disorder of the cerebral circulation, either general or local, in the way of congestion, anæmia, or an abnormal condition of the blood. The causes of giddiness are either *centric* or *eccentric*, including mainly injury or organic disease of the brain or its membranes ; degenerative changes in the cerebral vessels ; certain functional nervous disorders, as epilepsy ; movements influencing the cerebral circulation, such as swinging or waltzing ; febrile conditions ; exposure to paludal and other emanations ; tobacco smoking ; abuse of alcohol or narcotics ; renal disease ; gout ; suppression of chronic cutaneous diseases, hæmorrhages, or discharges ; anæmia ; excessive mental and bodily work, especially if combined with close confinement, anxiety and worry, excitement, and poor or irregular living ; digestive derangements ; organic or functional disorder of the heart affecting the cerebral circulation, especially a weak or fatty heart ; irritation of the nerves of special sense, such as a sudden strong light, unpleasant odours, or injection of water into the ear. The connection of vertigo with ear-affections is highly important, this symptom being often present in these complaints, and it is believed to be especially associated with

disease of the semi-circular canals. Many of the *eccentric* causes above-mentioned are supposed to act in a reflex manner, probably by influencing the cerebral circulation.

VARIETIES.—Certain forms of vertigo call for special notice. The *gastric* variety is described as occurring either in severe acute paroxysms, coming on quite suddenly, being often due to an undigested meal, and sometimes assuming a grave character, accompanied almost with loss of consciousness; or as a milder chronic complaint, either constant or occurring in frequent attacks. Dyspeptic symptoms are not prominent in most of these cases. The vertigo is of both kinds, but consists chiefly of apparent movement of external objects. The chronic form is rendered worse by fasting, and is often relieved by a moderate meal or by a little stimulant, as well as by shutting the eyes, or gazing fixedly at some object. Dr. Ramskill describes what he terms *essential vertigo*, which is observed mostly in persons about 30 years of age, who do not complain of any other symptoms, but in whom there are signs of a weak heart, and of a dilated right ventricle. He states that it is not materially improved by remedies, unless these are accompanied by rest and freedom from anxiety of every kind. Cases of vertigo connected with certain diseases of the ear have been denominated *Menière's disease*, Menière having pointed out the relation of these conditions to one another. This auditory vertigo is often associated with other symptoms, which may be of a serious character, simulating epileptic seizures or diseases of the brain, and among other phenomena have been noticed curious rotatory movements of the body, a tendency to fall, mental obscurity, with nausea and vomiting. Death has even occurred in such cases, no trace of any cerebral mischief having been found on *post-mortem* examination, but only disease of the semi-circular canals.

TREATMENT.

In order to relieve either of the head-symptoms just considered, a point of primary and essential importance is to find out its *cause*, as treatment has in most cases to be directed against this, and must be varied accordingly. In persons subject to headache or vertigo, attention to their diet, occupation, habits, and mode of life is frequently most essential. The various organs of the body must also be looked to, especially the digestive apparatus, vascular system, and kidneys. In many cases a course of *vegetable* or *mineral tonics* is highly serviceable; and arsenic proves very beneficial sometimes. When headache is merely temporary, associated with depressed nervous energy, *stimulants* will often relieve it, such as a little weak brandy and water, spirits of ammonia or chloroform, or a cup of strong coffee. Among *local* remedies which may be useful under various circumstances may be mentioned the use of cold, warm, or anodyne applications to the head; cold or warm affusion; sustained pressure around the head; the application of sinapisms or blisters to the nape of the neck or to some other part; and local removal of blood. Attention to posture may also be of importance in relieving headache or giddiness.

CHAPTER LI.

DISORDERS OF CONSCIOUSNESS.

CONSCIOUSNESS may be more or less exalted, the mental faculties being unusually keen and active; impaired in various degrees to absolute insensibility; or perverted in different ways. It will be impossible to discuss all the phenomena which may result from these disorders, but some of the most striking will now be considered.

I. DELIRIUM.

This symptom implies an acute and temporary disorder of the mental faculties, which generally reveals itself in the language or actions of the patient. It varies in degree, from slight wandering and incoherence, to the most complete and thorough derangement of the mental faculties. Frequently the patient has a fixed delusion. When the delirium is but slight, the patient can often be roused temporarily, so as to become tolerably coherent. It may be constant, but commonly tends to be worse by night, or may only come on at this time. In character the delirium may be mild and quiet; more or less wild and violent, the patient shouting furiously, or attempting to get out of bed, or to injure those around; talkative and cheerful; surly; suspicious; or low and muttering, when it is often attended with picking at the bed-clothes or carphology. In many cases delirium is associated with more or less stupor.

ÆTIOLOGY.—Delirium may arise either from excitement or depression of the cerebral functions, being accordingly either *active* or *passive*. The grey matter covering the cerebral hemispheres is specially affected when this symptom occurs. The causes of delirium are:—1. *Organic diseases* of the brain or its membranes, especially meningitis. 2. *Reflex disturbance* in connection with remote organs, such as the stomach, bowels, or uterus, particularly if attended with severe pain. 3. A poisoned condition of the *blood*, as in delirium tremens; acute febrile and inflammatory diseases; imperfect aëration of the blood; poisoning by belladonna and other substances. 4. *Nervous exhaustion*, as in delirium tremens partly; after excessive venery; or from undue mental exertion. 5. *Acute mania*. Some individuals are much more liable to delirium than others, particularly children and nervous persons.

TREATMENT.—In the treatment of delirium, if it is of the active kind and attended with much vascular excitement, the measures which may be needed are to shave the head; to apply cold assiduously; to use cold affusion; or to remove blood. In other cases the aim of treatment should be to endeavour to procure sleep, by means of some *narcotic*. Opium, which is sometimes usefully combined with tartar emetic or with some stimulant; hydrate of chloral; or full doses of bromide of potassium, often prove most serviceable. When delirium is of the low type, it is commonly an indication for the free use of *stimulants*. Warm affusion is

frequently of much value in these cases. An important object to be always borne in mind is the removal from the system of any deleterious materials which may be causing delirium. Of course due precautions must be taken, if necessary, to prevent the patient from injuring himself or others. All external sources of disturbance must be removed, and the patient kept as quiet as possible.

II. INSENSIBILITY—STUPOR—COMA.

THESE terms imply various degrees of suspension of consciousness, depending immediately upon some condition of the brain, complete coma being attended with absolute loss of sensation and perception, of the power of expression, and of voluntary motion; in short, with total abolition of all the cerebral functions. In investigating this symptom, it is important to take into consideration:—1. Its mode of onset, whether sudden or gradual, and if it is due to any obvious cause. 2. Its degree, noting if there are any signs of sensation evinced, as by touching the conjunctiva; and also whether the patient can be roused temporarily or permanently. 3. Whether the insensibility is transitory or persistent.

ÆTIOLOGY.—Pathologically loss of consciousness may result from injury to, or compression of the brain-substance; from extreme cerebral congestion or anæmia; or from the circulation through the brain of poisoned blood, or of blood which is inadequate to maintain its functions. The causes of insensibility are very numerous, and it will be expedient to give a complete list of them here, it being borne in mind, however, that coma implies loss of sensibility directly due to some cerebral disorder, and must be distinguished from asphyxia, syncope, and shock. They may be arranged thus:—1. *Local injury* to the head and its consequences, such as cerebral concussion; fracture of the skull; or compression of the brain. 2. *General shock to the system*, from injury; rupture of an internal organ; severe mental emotion; or any other cause. 3. Certain *functional nervous disorders*, viz., epilepsy, hysteria, convulsions. 4. *Morbid conditions of the brain or its membranes*, especially congestion; hæmorrhage; effusion in connection with the membranes or ventricles; cerebritis and abscess; embolism or thrombosis; chronic softening; and some cases of tumour. 5. *Blood-poisoning* from morbid conditions within the system, as uræmia, diabetes, certain cases of jaundice, low fevers. 6. *Introduction of poisons from without*, especially alcohol, opium and other narcotics, or prussic acid; and also the inhalation of certain gases and vapours, such as carbonic oxide or anhydride, hydric sulphide, chloroform, or ether. 7. *Syncope* from any cause. 8. Conditions inducing *asphyxia*. 9. As special forms of unconsciousness may be mentioned that which follows prolonged *exposure to cold*; *sunstroke*; a stroke of *lightning*; or *starvation*. 10. It must not be forgotten that sudden insensibility is a favourite form of *malingering*.

It will be convenient in this connection to make a few observations with regard to the term *apoplexy*. Originally this word merely implied an attack of sudden coma without convulsions, corresponding to what

is now called an *apoplectic seizure, fit, or stroke*; such a seizure, however, was found to be most commonly due to cerebral hæmorrhage, and hence apoplexy came to be employed as indicative of this particular pathological condition. Subsequently the meaning of the word was extended so as to denote hæmorrhage into any organ, for example, pulmonary apoplexy. Strictly this use of the term is quite incorrect, and it is highly important to bear in mind that apoplexy and cerebral hæmorrhage are not synonymous, for the former may be due to other causes, and the latter does not always give rise to an apoplectic seizure. The comatose state characteristic of apoplexy is usually accompanied by other phenomena, such as an alteration in the colour of the face; slow, laboured, or stertorous breathing; abnormal states of the pupils; changes in the pulse; or paralysis. These are extremely variable and inconstant, however, and therefore cannot properly enter into its clinical definition.

The ordinary causes of an apoplectic seizure are:—1. *Cerebral congestion—Congestive apoplexy.* 2. *Cerebral or arachnoid hæmorrhage—Sanguineous apoplexy.* 3. *Sudden anæmia of the brain*, due to embolism or thrombosis of a main vessel; cardiac failure, especially from fatty disease; or probably vaso-motor disturbance, leading to spasmodic contraction of the arteries. Rarely an apoplectiform attack is associated with:—4. *Uremia* and other forms of *blood-poisoning.* 5. *Sun-stroke.* 6. *Organic affections of the brain or its membranes*, such as meningitis, abscess, chronic softening, tumours. 7. It is said, sudden *serous effusion into the ventricles—Serous apoplexy.* The last-mentioned cause is, however, very doubtful, and the cases in which it is supposed to have occurred were probably those either of uræmic poisoning or of cerebral atrophy, though it must be added that some authorities believe that uræmia may lead to cerebral symptoms by causing rapid effusion of serum. 8. In extremely rare instances a fatal apoplectic attack has occurred where no morbid condition whatever could be detected at the *post-mortem* examination—*Simple apoplexy.* The immediate condition of the brain upon which an apoplectic seizure depends is a matter of dispute. Probably it may be due to a want of a proper supply of arterial blood, whether the result of interference with its entrance, of venous engorgement, or of a poisoned condition of the blood; of compression or actual destruction of the nerve-elements of the brain; or of shock.

TREATMENT.—The measures to be adopted when a person is insensible differ so materially according to the cause of this condition, that no uniform plan of treatment can be laid down. A few general hints may, however, be given regarding the management of the comatose state. The patient should be placed comfortably in the recumbent posture, with the head a little raised, all articles of clothing about the neck and chest being loosened, and plenty of fresh air being admitted. If it is known or suspected that the coma is due to poison, or even if there is much doubt as to the cause of this condition, there ought to be no hesitation about using the stomach-pump, as this instrument does no harm if properly employed, and may prove most serviceable. If the insensibility depends upon blood-poisoning, as from uræmia, means for promoting elimination of the deleterious agent, particularly by acting upon the skin, are highly valuable. In cases due to cerebral lesion it is

well not to interfere too actively at the outset. The chief measures which it may be necessary to have recourse to, in order to rouse the patient, are shaking and calling loudly; dashing cold water over the face and chest, or cold affusion; the application of sinapisms to the nape of the neck, and to various other parts of the body; the use of electricity; the administration of *stimulants*, especially by enemata; and artificial respiration. In certain cases it may be requisite to remove blood locally or by venesection. It is important in cases of prolonged unconsciousness to see that the limbs are kept warm; that the bladder and bowels are properly evacuated; and that the system is maintained by adequate nourishment, which may be administered by enemata.

CHAPTER I.II.

DISORDERS AFFECTING SLEEP.

THE disorders in connection with sleep which may be met with are chiefly of three kinds, namely:—1. *Somnolence* or undue sleepiness. 2. *Insomnia* or sleeplessness; or where the sleep is restless and disturbed. 3. *Somnambulism* and *somniloquism*, or sleep-walking and sleep-talking, with allied states. Each of these requires brief consideration.

1. **Somnolence.**—This implies either that there is an increased disposition to sleep; or a condition of profound sleep, which may last for considerable periods, and from which it is very difficult or even impossible to rouse the individual, this condition culminating in a state of *trance*. Abnormal sleepiness or drowsiness is mainly observed under the following circumstances:—*a.* In certain subjects who are naturally of a *lethargic temperament*, and who will fall asleep at any time if allowed to remain quiet. *b.* As the result of the effects of considerable *external heat* or *cold* upon the general system. *c.* In consequence of *over-eating*, and in some cases of *dyspepsia*. *d.* From *blood-poisoning*, in connection with renal disease; the advanced stage of fevers; some cases of jaundice; indulgence in excess of alcohol; or the introduction of narcotizing agents into the system. *e.* Owing to *imperfect aeration of the blood*, as, for instance, from being in over-crowded and badly-ventilated rooms; or as the result of diseases interfering with the respiratory process. *f.* In connection either with a *plethoric* or an *anæmic* state of the system. *g.* From *imperfect nutrition of the brain-substance*, such as that due to disease of its vessels, when the drowsy condition may be premonitory of apoplexy. *h.* In some cases of *disease of the brain or its membranes*. *i.* As the result of *starvation*.

Remarkable cases of prolonged sleep have been occasionally observed, having no evident cause. Others are associated with hysteria, or with marked anæmia. Some individuals are able, after a long period of mental labour with deficient sleep, to indulge in sleep of considerable duration, and thus to make up for that which they have lost.

2. **Insomnia.**—This is often a serious condition, and one which gives much trouble to the practitioner. It may be that the patient feels no

inclination to sleep ; or that the desire for repose is experienced, and may even be urgent, but there is a dread of going to sleep ; or slumber is very restless and much disturbed, perhaps only uneasy dozes of short duration being obtained, from which the patient wakes up in a state of agitation or terror. Rest is often interfered with in consequence of unpleasant dreams ; or it may be prevented by bodily or mental suffering, cough, or other causes. The effects of prolonged want of sleep are very grave ; it is a prominent cause of insanity, while it often gives rise to great distress in cases which come under observation in ordinary practice. In times past forcible prevention of sleep was resorted to as a means of torture. At the same time it may be remarked that under certain circumstances many individuals can do with very little sleep for a considerable period.

The most important conditions with which insomnia may be associated are as follows :—*a. Insanity*, of which sleeplessness is also often a marked premonitory symptom. *b. A state of cerebral excitement or exhaustion*, or of *mental disquietude*, resulting from undue intellectual effort or excessive study, especially if sleep has been neglected ; mental anxiety or worry in connection with business or other matters ; exciting passions ; or other causes. *c. Acute febrile diseases*, particularly at their early stage. *d. Dyspepsia* in a considerable number of cases. *e. Chronic alcoholism and delirium tremens*. *f. After taking strong tea or coffee*. *g. Conditions accompanied with great bodily pain*, or other forms of suffering. *h. Some cases of disease of the brain or its membranes*, especially meningitis in its early stage. *i. Certain peculiar affections of the nervous system*, such as tetanus or hydrophobia. *j. Disease of the heart*, in which want of sleep is often a serious symptom ; and also *disease of the great vessels* occasionally. *k. Abnormal blood-conditions*, such as anemia in some cases, gout, or sometimes the presence of bile in the blood. *l. Pregnancy*, and the condition following parturition, especially in nervous and excitable women.

3. Somnambulism Somniloquism.—These conditions have been regarded as being due to an incomplete sleep or partial waking, but it is more probable that they are associated with a state of abnormally profound and heavy sleep. In this state dreams exercise an unusual influence, and excite motor acts of various kinds, of which somnambulism is the most remarkable. When an individual is in either of these conditions, he is perfectly unconscious of his actions, knowing nothing about them on waking from sleep, and it is usually difficult to rouse him fully. Somnambulists will go to most dangerous places, and perform strange and complicated acts ; they may also sleep for very prolonged periods. Their general health is often quite satisfactory. These disorders of sleep occasionally assume a periodic character.

Somnambulism and allied states usually commence during youth or at puberty. They generally originate from some definite cause, such as overloading the stomach, violent mental emotion, or over-study, but once established they may continue independently of any such exciting cause. Occasionally hereditary influence has been traced. Sleeping on soft luxurious beds, and with the head low, may act as predisposing causes of these conditions.

TREATMENT.—In the management of cases in which any disorder

affecting sleep occurs, the first object in treatment must be to endeavour to find out its *cause*, and, if possible, to remove or counteract this. Regulation of the diet, especially late in the day, and of the general habits; avoidance of an undue quantity of tea, coffee, alcohol, &c.; the taking of a proper amount of exercise daily; avoidance of excessive mental labour, excitement, or worry; and attention to the conditions of the bed-room and bed, will often prove of much service. The apartment must be properly ventilated, and the bed should have a firm mattress and pillows, without too many bed-clothes, the head being well-raised. Then the condition of the blood must be improved, if necessary, and any organ attended to a diseased condition of which may be the cause of disturbed sleep, as well as any special disease upon which this may depend. Treatment directed to the alimentary canal is often of the greatest service. In cases of insomnia due to mental causes, entire cessation from occupation, and a change of air and scene are frequently of the highest value. Pain and other causes which may prevent sleep must be treated by appropriate remedies. The direct measures employed for procuring sleep are the administration of *sedatives*, *anodynes*, or *narcotics*, either internally, by enema or suppository, or by subcutaneous injection, such as opium or morphia, hydrate of chloral, bromide of potassium, cannabis indica, hyoscyamus, conium, hop, belladonna, or nuphar; the use of *local applications* to the head, for instance, a wet bandage, cold or warm douching, or the ice-bag; and the employment of mesmerism, Braidism, and similar agencies. In some cases a glass of stout, of wine-negus, or of some spirit and water, taken just before going to bed, is decidedly useful for procuring sleep. Fixing the eyes steadily upon some point, counting to a hundred, being read to, and various other devices are resorted to with the view of obviating sleeplessness, and they sometimes succeed.

In cases of somnambulism and similar conditions, it may be desirable to try to break off the habit by waking the patient once or twice during the night. Somnambulists must, however, on no account be suddenly awakened when they are in the act of walking, even apart from their being in dangerous places, as this may cause a fright which may lead to very serious consequences.

CHAPTER LIII.

MOTOR DISORDERS.

A summary of the various disorders affecting motion has already been given, when indicating the clinical characters of nervous diseases. In the present chapter it is only intended to discuss the chief phenomena indicating undue muscular irritability; and the principal forms of paralysis. It must be mentioned, however, that these two classes of phenomena are not uncommonly associated in various degrees and forms in the same case, though they more frequently occur separately.

I. SPASMS—CONVULSIONS—ECLAMPSIA.

Spasms may be defined as involuntary contractions of the muscles, varying widely as regards their intensity, and being either intermittent and interrupted, with intervals of relaxation, the movements being often of a jerky character—*clonic spasms*; or more or less continuous and persistent—*tonic spasms*, these in their extreme form culminating in permanent *rigidity*. If spasms are accompanied with severe pain, they constitute the condition known as *cramp*. The violent tonic contractions observed in lock-jaw and strychnine-poisoning are named *tetanic*. There is not, however, any marked line of demarcation between these different forms of motor disorder.

The spasmodic movements implied by the term *convulsions* vary considerably in their severity and extent; and also as to the parts of the body which they involve. Thus they may be slight and localized; unilateral; or more or less general. Some writers include under convulsions all forms of motor disorder in which there are unusual involuntary movements, such as fibrillar trembling of muscles, muscular flickerings, various kinds of tremor, and choreic movements. Ordinarily, however, the term implies more or less marked spasmodic movements, and these may be so violent as actually to rupture the muscles. *Eclampsia* is a word which is now often used to characterize all forms of powerful convulsions of a more or less epileptiform type, whatever their cause may be. According to the extent and localization of the convulsions, we are frequently able to refer their origin to some special part of the nervous system, as will be hereafter pointed out. Not uncommonly convulsions are accompanied or followed by partial or complete loss of consciousness. They are of much importance in children, in whom a series of *convulsive fits* are liable to occur from very slight causes—*infantile convulsions*. They are frequently preceded by premonitory indications of nervous disturbance, such as twitchings, grinding of the teeth, restlessness or peevishness, which in children should always be looked upon as warnings. It is unnecessary to describe the distortion of the features, and the various movements of the limbs and body which may result from convulsive spasms, these being usually a combination of the clonic and tonic varieties, the former predominating. The chief dangers in connection with convulsions arise from implication of the respiratory muscles or glottis, leading to grave interference with breathing; from obstruction to the return of blood from the brain; and from the exhaustion which the extreme violence or frequent repetition of the fits may cause, especially if they prevent sleep for a long period. Serious sequelæ may follow as direct consequences of convulsions, such as hemiplegia; strabismus; loss of sight, smell, or hearing; defect of speech; or impairment of the mental faculties.

ÆTIOLOGY.—All forms of motor disorder now under consideration are referable to some kind of irritation, acting upon some portion or other of the nervous system. Convulsions have been immediately attributed to "an abnormal discharge of unstable grey matter" (Hughlings Jackson). They originate in some irritation or *discharging lesion*, either direct or indirect, affecting this grey matter. The main causes may be

arranged thus :—1. **Centric.** *a. Injuries* to the head, especially fracture of the skull, with irritation of the grey matter by spicula of bone. *b.* Various *organic diseases* of the brain and cord or their membranes, viz., all forms of meningitis, hydrocephalus, cerebral hæmorrhage, rupture of an aneurism, embolism, softening, tumour. *c. Idiopathic, dynamic, or essential.* Here the convulsions are independent of any obvious organic mischief, but are supposed to result from some vascular or nutritive disturbance in the brain, as in some cases of epilepsy, hysteria, or the convulsions induced by strong emotions. *d.* Circulation of abnormal *blood* through the central nervous system, as exemplified by the convulsions which in children sometimes usher in, or occur during the course of acute specific fevers or inflammatory diseases; uræmic convulsions; and those which may be associated with imperfect aëration of the blood, or, it is said, with rheumatic fever, jaundice, syphilis, tuberculosis, and rickets. In the two conditions last-mentioned, however, the nervous system is probably highly susceptible, and convulsive movements may be excited by very slight reflex disturbance. 2. **Eccentric, reflex, or sympathetic.** In this class of cases the convulsions are due to some *reflex irritation*, particularly in connection with dentition; digestive disorders; intestinal worms; or the passage of a gall-stone or a renal calculus. Occasionally they result from direct irritation of some local nerve; the pricking of a pin in the clothes of a child; the application of a blister; or a burn of the skin. *Puerperal* convulsions are either uræmic or reflex in their origin.

The most favourable periods of life for the occurrence of general convulsions, independent of organic disease, are childhood, especially during the periods of dentition; puberty; when cutting the wisdom-teeth; and at the change of life. In children the ordinary causes are reflex irritation; the onset of some acute fever or inflammation; tubercular meningitis; or the presence of some chronic constitutional illness. Later in life they are most frequently associated with epilepsy; with organic affections of the nerve-centres; or with uræmia.

TREATMENT.—In treating spasmodic movements, if they should call for special interference, and especially if they are of the nature of general convulsions, the indications are :—1. To look for any *reflex irritation*, and remove this if possible, particular attention being paid in the case of children to the teeth and alimentary canal, the gums being lanced, or an *aperient* or *emetic* given, if required; at the same time regulating the feeding. It is also well to examine the clothes for any source of irritation. 2. To treat any *disease* with which the convulsions may be associated, such as rickets, tuberculosis, epilepsy, central organic disease, or blood-poisoning. 3. To mitigate or check the *spasmodic movements*. During a paroxysm of convulsions the recumbent posture; freedom from every disturbance; relaxation of the clothing about the neck and chest; and a free current of cool fresh air, are needed. It is not advisable to restrain the movements except in so far as to prevent injury to the patient. Water may be sprinkled over the face and chest. If the convulsions continue, a warm bath containing mustard; the application of ice to the head; warm pediluvia; cold or warm affusion; and the application of sinapisms to the nape of the neck, epigastrium, or extremities, are

the chief remedial measures which may be employed. Many practitioners resort at once to the application of leeches to the temples or back of the neck, or to venesection, especially in the case of robust children ; but in most cases this is needless or injurious, and as a rule removal of blood is only indicated when there are signs of serious interference with the respiratory functions. The principal medicinal remedies available are *narcotics* and *antispasmodics*, especially bromide of potassium ; hyoscyamus in full doses ; opium ; hydrate of chloral ; chloroform by inhalation ; and assafoetida by enema. Of course most of these drugs need due caution in their administration. It is of the greatest importance to endeavour to procure sleep if this is much interfered with, particularly should there be much exhaustion. The milder forms of spasm and cramp may often be considerably mitigated by friction, dry heat, judicious restraint, and other measures. 4. To treat the *consequences* of convulsions. The chief dangers are from suffocation and exhaustion. To obviate the former, removal of blood and artificial respiration are indicated. To prevent or counteract exhaustion, it is extremely important to administer abundant liquid nourishment, especially in the case of weakly or badly-fed children, and if it cannot be taken by the mouth, enemata must be employed. *Alcoholic stimulants* are also most useful in many cases, being sometimes required in considerable quantities, along with *medicinal stimulants*, such as ammonia, ether, camphor, or musk. The administration of food and stimulants often promotes sleep most efficiently.

II. MOTOR PARALYSIS OR PALSY--PARESIS.

MOTOR paralysis is a symptom of the greatest importance in nervous diseases. Some of the main points to be noted with regard to it have already been indicated when discussing the physical examination of the nervous system, and it is only needful further to remark, that particular attention must be paid to its mode of onset, whether sudden or gradual ; its exact extent and distribution ; its degree ; whether it is permanent or temporary, constant or variable, or influenced materially by volition, emotion, or other causes ; as well as to its subsequent progress, observing whether the paralysis tends to become worse, to improve, or to invade other muscles ; and if any additional phenomena arise in the affected part, especially involuntary reflex movements, clonic or tonic spasms, rigidity, or permanent flexion of joints. The tendency in many forms of persistent paralysis is towards imperfect nutrition of the tissues from mere want of exercise, as evidenced by softness and flabbiness of the muscles and other structures, wasting and diminution in the circumference of the limb, with dryness and scurfiness of the skin ; and to feebleness of the circulation, the pulse becoming small and weak, the skin pale or blue and congested, and the temperature lowered, while the affected part is much more influenced by the temperature of the surrounding medium than in health, and oedema sets in in some instances. Under certain conditions serious trophic lesions occur with great rapidity, such as acute bed-sores, as will be hereafter pointed

out. Occasionally an extraordinary growth of hair is observed over a paralyzed part.

There are certain important varieties of paralysis, designated according to its mode of distribution in the body, some of which it will now be requisite to consider briefly. They include:—1. **General paralysis**, which does not necessarily imply that every muscle in the body is affected, but the term is applied to that condition in which both arms and legs are paralyzed, along with more or less of the trunk. 2. **Hemiplegia** or unilateral paralysis. 3. **Paraplegia** or paralysis of the lower extremities; the lower part of the trunk, with the bladder and rectum, being usually involved at the same time. 4. **Disseminated or irregular paralysis**, when the paralysis is distributed in various parts of the body, as, for instance, in the arm and leg on opposite sides, or in the limbs on one side and the face or eye on the other. 5. **Local**, where the palsy is limited to one limb or a part of it; to certain muscles which are supplied by a special nerve, as the facial, or which are associated in their action for a particular function; or even to a single muscle.

1. **General Paralysis** is met with:—(i.) Rarely in cerebral diseases, viz., temporarily in congestion; in hæmorrhage into certain parts, as into the pons, both ventricles, or the meninges; and in some cases of tumour, extensive softening, or meningitis. (ii.) In connection with disease or injury of the upper part of the spinal cord. (iii.) In the early stage of essential paralysis of children and allied conditions. (iv.) As a sequela of diphtheria. (v.) In extreme progressive muscular atrophy. (vi.) In general paralysis of the insane. In the disease last-mentioned the paralysis begins in the tongue, as shown by impaired articulation, with tremulous movements of the organ and a difficulty in its protrusion. Next the muscles of the face quiver, especially those of the lips; while the pupils are often unequal. Then follows weakness of the limbs, with unsteadiness of gait, the patient stumbling and staggering on turning round suddenly, the ability to perform various ordinary actions being also impaired. When the muscles are put into action, they are tremulous. More or less speedily, and usually by interrupted grades, the paralysis extends and increases until the patient becomes utterly helpless, and is unable to swallow, food passing into the larynx; while the pupils are unequally dilated; and urine and feces escape involuntarily. Automatic and reflex movements also cease. The muscles do not waste much as a rule, and they retain their electric irritability. During the progress of the paralysis twitchings and spasms are common. The muscular sense is much affected. Cutaneous sensibility is generally impaired and finally lost. Mental derangement usually precedes the paralysis; it may assume various types, but in most cases there is a brief period of melancholia, followed by a marked change in character, then incoherence, with delusions as to personal importance and greatness, the patient imagining himself to be extremely strong, wealthy, of high birth, or possessed of wonderful sexual powers. The ultimate condition is one of absolute dementia, the mind becoming a complete wreck.

2. **Hemiplegia**.—In the majority of cases of one-sided paralysis only the muscles of the arm, leg, trunk, lower part of the face, and

tongue are involved in various degrees. In some cases there is a difficulty in wrinkling the forehead or closing the eye ; or, on the other hand, the upper eyelid may drop slightly. Speech is often affected, but usually only in cases of right hemiplegia. Deglutition is rarely interfered with. The 3rd, 4th, and 6th nerves almost always escape, while the motor branch of the 5th is also usually but little, if at all affected. The signs of paralysis of the several cranial nerves will be pointed out when they are individually discussed. It may be noticed that they are more liable to be involved according to their proximity to the posterior extremity of the brain. This may be due to their anatomical arrangement, the fibres of the unaffected nerves lying outside the track of the lesion, and being, therefore, beyond its influence ; but it has also been attributed by Broadbent and others to the more intimate connection of the nuclei of the nerves which escape with the corresponding nuclei on the opposite side of the brain, so that they are more influenced by impulses which start from these healthy nuclei. The arm and leg are most affected in hemiplegia, and if the paralysis is complete the limbs are quite helpless, in the recumbent posture the leg tending to rest on its outer side, with the toes everted. If it is partial, but still well-marked, the gait is usually very characteristic. The patient leans towards the sound side, lifting up the opposite shoulder, and while the arm often hangs helplessly, the leg during progression is carried forward by describing a kind of outward swing or sweep, while the toes are directed downwards towards the ground. In less-marked instances the leg merely drags, the toes, however, pointing downwards, while the arm cannot be moved well, and the power of squeezing is diminished. The leg may be less affected than the arm, and paralysis may occur later in this limb. As regards the muscles of the neck and body, these are as a rule but little affected, and if they are implicated at first, they generally speedily recover their power.

Not uncommonly partial restoration is effected after hemiplegia, which almost always commences in the leg, beginning above and extending downwards, the muscles on the front of the leg being last restored. The arm may remain for a long time, or even permanently, disabled ; if it improves, recovery takes place from the proximal towards the distal part of the limb, as in the leg. Generally there is no limitation of the reflex movements of respiration on the affected side, at least for some time ; further, other reflex movements may be readily excited, sometimes even more easily than in health ; while the paralyzed muscles of expression can in some instances be brought into play under the influence of strong emotion. The muscles do not in the large majority of cases show any tendency to waste, except to such a degree as can be accounted for by mere disuse and inactivity. Moreover, electric irritability is not impaired, and may even be increased at first ; after prolonged disuse of the muscles it may become somewhat diminished, but can speedily be restored. Under certain circumstances, however, rapid wasting and loss of contractility occur. The temperature is at the outset generally raised on the paralyzed side, but afterwards falls below the normal, it may be as much as 1° or more. "Late rigidity" or "contracture" not uncommonly sets in in the affected limbs, especially in the arm. It involves the flexors more particularly ; is variable in degree ; and is

at first remittent and capable of being overcome, being mainly observed during voluntary efforts or under excitement, but by degrees becomes permanent and more and more marked, until at last the limb is completely flexed and rigid. The cause of this "late rigidity" has been much disputed. Probably it is due to descending sclerosis involving the motor tracts of the crus, pons, medulla, and spinal cord, as has been maintained by Charcot, Bastian, Ferrier, and others. Hughlings Jackson regards the condition as a species of tonic distortion, caused by the cessation of cerebral influence over the muscles which in health the cerebrum chiefly innervates, and consequent unantagonised action of the cerebellar centres, and unimpeded cerebellar influx. Duret is inclined to attribute late rigidity exclusively to reflex irritation, owing to the irritation extending to sensory tracts. Ferrier thinks it is possible that in some cases reflex contracture may be superadded to that due to sclerosis.

ÆTIOLOGY.—(i.) Hemiplegia is in the large majority of cases a sign of *organic cerebral disease*, the paralysis being almost always on the side opposite to that of the lesion. By far most commonly it results from some lesion affecting the corpus striatum or the neighbouring white substance, either directly or indirectly, and causing actual destruction, compression, hyperæmia, or anæmia; it may, however, be immediately associated with injury or disease of a certain portion of the cerebral convolutions, or of other parts of the brain, as will be pointed out in a subsequent chapter. The morbid conditions which may thus give rise to hemiplegia are :—*a.* Rarely congestion, it being then merely temporary. *b.* Hæmorrhage most commonly. *c.* Embolism or thrombosis of a considerable artery. *d.* Acute cerebritis or softening, and abscess. *e.* Chronic softening from any cause. *f.* Cerebral tumour. *g.* Unilateral meningitis. (ii.) In very exceptional instances hemiplegia results from *unilateral disease of the spinal cord*. Of course there is then no facial paralysis. (iii.) Occasionally this form of paralysis is observed in connection with certain *functional nervous diseases*, apart from any evident organic lesion, namely, chorea, epilepsy, and hysteria. It may also be associated with parturition.

3. **Paraplegia.**—This form of paralysis varies much in degree, and comes on either gradually, rapidly, or suddenly. When it is complete, the utter helplessness of the legs as the patient lies in the recumbent posture or attempts to stand supported on each side, is very striking; in less advanced cases there is more or less weakness and difficulty in movement, with unsteadiness of gait, dragging of the feet, and stumbling while walking. Reflex movements are usually very easily excited. The condition of electric irritability varies in different cases. The height to which the paralysis extends up the trunk will depend upon the seat of the lesion in the spinal cord.

ÆTIOLOGY.—(i.) Paraplegia is in the large majority of cases the result of *injury to or disease of the spinal cord*. Thus it may be due to :—*a.* Fracture or dislocation of the spinal column; or a wound or violent concussion of the cord. *b.* Compression of the cord from without by a tumour. *c.* Caries of the spine and its consequences. *d.* Spinal congestion, when the paralysis is usually partial. *e.* Spinal meningitis. *f.* Acute myelitis. *g.* Chronic softening or sclerosis. *h.*

Hæmorrhage into the cord. *i.* Morbid growths or parasites in its substance. (ii.) Sometimes paraplegia is a purely *functional disorder*, being met with in hysteria; as the effect of some powerful emotion; or as a reflex phenomenon, in connection with uterine affections, pregnancy, urinary diseases, dentition, worms, or after exposure to cold and wet.

4. **Local and Special Paralyses.**—It is not intended here to describe the many varieties of local paralysis which may come under observation, but merely to point out their general causes, and to consider the chief facts relating to paralysis of certain special motor nerves.

Local palsy may be an indication of slight or commencing central disease; but in the majority of cases the cause is *peripheral*, either directly affecting one or more nerves, or certain muscles. This *peripheral* paralysis may be due to:—(i.) Destruction of a nerve from injury. (ii.) Pressure upon it by a tumour, aneurism, or inflammatory thickening; or mere temporary compression, as from prolonged sitting or lying on the arm. (iii.) Changes induced in the nerve itself, probably mostly inflammatory, from neighbouring irritation, such as that set up by necrosed bone or ulceration; exposure to cold; syphilis; rheumatism or gout. (iv.) The entrance of certain poisons into the system, especially lead; or, it is said, malarial poison. (v.) Changes in the muscles, either atrophic or degenerative, as in progressive muscular atrophy. Local paralysis may be a sequela of diphtheria, or more rarely of other febrile affections. It may also result from local embolism. When paralysis results from disease of a nerve or of its nucleus of origin, it is limited to the muscles supplied by that particular nerve; tends speedily to become complete; and is very liable to be followed by rapid wasting, with loss of electric irritability.

a. **Facial Paralysis**—**Bell's palsy.**—Paralysis of either facial nerve, and consequently of one side of the face, is the most important local variety that comes under observation in practice, the entire nerve being then usually involved. The signs are as follows:—There is complete absence of expression on the affected side of the face, which appears flattened and smooth, the features being blank and meaningless. The corresponding half of the mouth seems broader than the opposite half, while the angle falls. Sometimes saliva flows from the mouth. The ala of the nose falls in, and consequently the nasal aperture is diminished in size. The healthy side of the face appears to be or is actually drawn away, and the angle of the mouth seems to be raised. The eyelids on the paralyzed side are unusually apart, the lower one dropping down, and as they cannot be closed the tears tend to trickle down the cheek, the corresponding nostril is dry, and the constant exposure of the eye-ball soon leads to irritation of the conjunctiva, which is liable to be followed by serious injury to the deeper structures. It is, however, on attempting to bring the affected muscles into play that the most evident signs of facial paralysis are afforded. The patient cannot smile, weep, wrinkle the forehead, elevate the eyebrow, frown, close the eyelids, knit the brows, or expose the teeth on the paralyzed side. Articulation of labial sounds is impaired, as well as the ability to whistle; while if the patient is directed to blow out the

cheeks, the affected one flaps loosely. During mastication the food tends to collect between the cheek and gums, while fluids often run out of the mouth; the power of spitting is also impaired. If the facial nerve is implicated in a certain part of its course, other less obvious signs are said to be observed, dependent upon some of its branches being distributed to the tongue, salivary glands, and palate, namely, perversion of taste on one side, and occasionally slight drawing of the tongue towards the same side; deficient secretion of saliva; relaxation and imperfect action of the velum palati on, and pointing of the uvula towards the affected side; with a somewhat nasal character of the voice.

ÆTIOLOGY.—It is of considerable importance to recognize in what part of its course the facial nerve is implicated, and to determine the cause of the mischief. The causes of facial paralysis may be summarized thus:—(i.) Organic mischief in the brain, involving the root of the nerve. (ii.) Pressure upon the nerve within the skull after it has emerged from the brain, especially by various kinds of tumour, or by meningeal exudation. (iii.) Injury or disease involving the nerve in its course through the temporal bone, chiefly from necrosis of the petrous portion of this bone, or from gunshot injury. (iv.) Causes affecting the trunk or branches of the nerve after its exit from the stylo-mastoid foramen, viz., injury, as from a cut or contusion; pressure by parotid and other tumours or enlarged glands; direct exposure of the side of the face to a cold draught of air, as in travelling by train with the window open; general exposure to cold and wet; gout, rheumatism, or syphilis; or, it is said, malarial influence.

DIAGNOSIS.—The diagnosis of the origin of facial paralysis rests on:—1. The *history* of the case, as revealing some of the causes just enumerated; and also the *mode of onset* of the paralysis, whether sudden or gradual. 2. The *accompanying symptoms*. Thus, when the paralysis is due to cerebral mischief, there are generally evident signs of this, such as hemiplegia and mental disturbance; if there is some intra-cranial pressure outside the brain, headache and other local symptoms are commonly complained of, while other cranial nerves are frequently involved, and sometimes paralysis of the limbs is observed on the opposite side. If the temporal bone is diseased, deafness and otorrhœa are usually present. If the nerve is affected outside the skull, some cause of pressure may be obvious; there may be no symptoms whatever except the paralysis; or the sensory nerves of the face are sometimes implicated as well, in the direction of neuralgia or anæsthesia. 3. The *extent of the nerve* involved. When facial paralysis arises from cerebral causes, it is only the lower part of the face which is in most cases prominently affected, the muscles of the eyelids and forehead either acting normally, or being only slightly weakened. In all the other forms the whole side of the face is paralyzed. It is only when the nerve is implicated in its course through the temporal bone that the palate and tongue are affected. 4. The *degree of electric irritability*. In cerebral paralysis electric irritability is retained, unless the disease lies at the origin of the nerve; in all the other forms it is impaired or lost temporarily or permanently, except when due to cold, when there may be increased

irritability to a slow galvanic current. 5. The *progress* of the case, and the *effects of treatment*. For instance, when due to tumour, injury, or bone disease, the paralysis is generally persistent; when originated by cold, rheumatism, or syphilis it may often be cured by proper treatment.

In very rare instances *double facial paralysis* is observed, but it is difficult to recognize. It may be due to centric disease, especially hæmorrhage into the pons; or, it is said, to disease of the nerves from exposure to cold, rheumatism, or syphilis.

b. Paralysis in connection with the eye.—The nerves to be considered here are the *third*, *fourth*, and *sixth*. When either of these is involved, this is indicated by some variety of strabismus, with double vision, the relative position of the images seen by the two eyes varying in each case. Complete paralysis of the *third* nerve is characterized by ptosis or dropping of the upper eyelid, with inability to raise it; permanent external strabismus; dilatation and immobility of the pupil, which is usually directed a little downwards; and a difficulty in adapting the eye to vision at different distances. In some cases only ptosis is observed, when the paralysis is peripheral in its origin. The cause may be centric disease; pressure upon the nerve in its course; exposure to cold; or rheumatism. When the *fourth* nerve is paralyzed, the superior oblique muscle cannot act. This is shown by upward strabismus; displacement of the false image downwards; and when the eye-ball is depressed, the pupil is seen to move in a curved line directed downwards and towards the opposite side, the false image being tilted towards this side, when the pupil is below the horizontal line. Paralysis of the *sixth* nerve is evidenced by persistent internal strabismus; and displacement of the false image towards the side opposite to the paralysis. These forms of paralysis are generally associated with some pressure in the course of the nerves, especially by a tumour or meningeal exudation. Sometimes all the nerves of the eye are simultaneously affected.

c. Paralysis of the tongue.—As a rule unilateral paralysis of the tongue, dependent upon implication of the *hypoglossal* nerve, is a part of hemiplegia. The signs are a widening of the tongue on the affected side; difficulty in its movement and protrusion; deviation of the organ to the sound side when in the mouth, to the paralyzed side when protruded; and impaired articulation. The entire tongue may be paralyzed, rendering articulation impossible, and deglutition very difficult.

d. Paralysis of the pharynx is mainly indicated by great difficulty or impossibility of swallowing; and more or less thickness of speech, which assumes a guttural quality, or may be quite unintelligible. It usually results from some centric disease, affecting the nuclei of the nerves supplying the pharynx, as in glosso-pharyngeal paralysis; or occurs as a sequela of diphtheria. Other parts are also generally implicated, either simultaneously or in succession.

e. Paralysis of the inferior maxillary nerve is evidenced by impaired power of mastication on the affected side; and certain derangements of the muscular movements concerned in this act. When the jaws are firmly closed, the temporal and masseter on the paralyzed side

remain flaccid, and do not harden. On moving the lower jaw forwards or backwards it assumes an oblique position, in the former case the inclination being towards the paralyzed side, especially noticeable when the patient opens his mouth widely; in the latter case towards the unaffected side. Usually motor paralysis of this branch of the fifth nerve is accompanied with sensory derangement, and the other branches are in most cases involved. The condition generally depends upon some local disease.

TREATMENT.—The objects to be aimed at in treating paralysis of any part are to restore the muscles to their normal activity as speedily as possible, if this is practicable; and to counteract the tendency to the atrophic and other changes to which the structures are liable. Of course the measures to be adopted must first of all have reference to the *cause* of the paralysis, by removing which restoration is often rapidly and completely effected. As illustrations may be mentioned the use of iodide of potassium in the treatment of paralysis due to syphilis or lead. In many forms of paralysis *time* is a most important element in treatment, and much harm may be done in not a few instances by interfering too actively or too soon. It is requisite to see that a paralyzed part is properly covered with warm clothing, and that it is kept clean. The chief local measures employed to counteract palsy are systematic passive motion of joints, which may be combined with efforts at voluntary movements; various baths and douches, either hot or cold; friction, either with the hand alone, with flesh-brushes or gloves, or with some stimulant liniment; shampooing; and electricity, which may also be usefully combined with voluntary attempts to move the muscles.

The employment of *electricity* in the treatment of paralysis demands special notice, and it will be convenient here to give a brief summary of the main facts pertaining to this subject, derived chiefly from Dr. Russell Reynolds's work. Much discrimination and caution are needed in resorting to this therapeutic agent, as it is very powerful for evil as well as for good. The beneficial results which electricity is capable of effecting in paralysis are as follows:—1. Restoration of the functions of a muscle or nerve when its activity is impaired and thus possibly restoration of voluntary movement. 2. Prevention of wasting of the muscles, and consequent arrest of the progress of the disease. 3. Increase in the vascularity of a part, thus removing coldness, blueness, and other signs of feeble circulation. 4. Improvement in the nutrition of the muscles, nerves, and other structures should they be atrophied or ill-nourished. 5. Prevention, retardation or removal of spasmodic contractions and rigidity. 6. Probably the long-continued use of electricity may improve the nutrition of the part of the nerve-centre from which the nerve or nerves which supply the affected muscles originate. The kind of electricity required varies in different cases, but it may be stated generally that for promoting the action of muscles faradization and the interrupted galvanic current are most useful, though franklinic electricity is occasionally more beneficial than either; that for improving the circulation and nutrition the continuous galvanic current, or faradization by means of a metallic brush answer best; whilst to oppose the excessive action involved in spas-

modic movements and rigidity (and this applies to these conditions under all circumstances), a weak constant galvanic current, or very rapidly-interrupted faradization may be applied to the affected muscles; or in certain conditions of rigidity, the use of faradization or interrupted galvanism to the antagonistic muscles is most efficacious.

Some general hints as to the employment of electricity in treating paralysis will now be given. Care must be taken not to frighten the patient at the outset. The current used must not be so strong as to cause pain; or, on the other hand, so weak as to be useless; and the application should be brief, so as not to tire the patient or the muscles. It may be repeated twice a day, daily, or every other day, according to circumstances. In employing galvanism, one handle, containing a sponge of sufficient size and well-wetted, must be kept fixed in one spot, such as over the shoulder or in the bend of the elbow in the case of the upper extremity; and the other drawn slowly along the muscles in succession. With faradization the two poles must be kept near together, and it is almost always best to hold both in one hand and draw them along each muscle. More action is excited at certain spots, which generally correspond to the points where the nerves entering the muscles are most superficial. In treating paralysis of a special nerve, one handle must be placed over the trunk of the nerve, and the other moved about or not, according as galvanism or faradization is employed.

A few observations will now be offered on the uses of electricity in the chief varieties of paralysis.

(1.) *Cerebral*.—In cases of sudden cerebral paralysis electricity must on no account be used for some time, even for purposes of diagnosis or prognosis, and the greatest care is necessary in its employment for a long period. Even if the paralysis has been gradual in its onset, caution is needful should there be head-symptoms, such as headache, a sense of weight, or giddiness. Much improvement may be effected in other cases in the various directions already indicated; but, so far as the paralysis itself is concerned, the value of electricity will depend on the degree of contractility shown by the muscles on its first application. If this is normal or nearly so, the power of voluntary movement can be but slightly, if at all, increased by its application. If it is much diminished from want of use, much good may be done by reviving the contractility of the muscles, but once this has become normal, no further improvement as regards voluntary motion can be effected.

(2.) *Spinal*.—If the muscles act readily under electricity in cases of complete spinal paralysis, the power of voluntary movement in the limbs cannot be increased by its use, but sometimes the functions of the bladder, rectum, or sexual organs may be much improved by its local application to the anus or perinæum. If the paralysis is partial and contractility is impaired, much good may be effected up to the point of restoring the contractility; electricity must not, however, be employed in acute cases of this kind, but it is of the greatest value in those which have set in slowly. If there is atrophy of the limbs, galvanism is most efficacious; if none, faradization. Should there be the complete "spinal paralysis" of Marshall Hall, electricity cannot

improve the power of movement, and if no sign of contractility is observed after a few applications, it is useless to proceed with its use; if the contractility is merely impaired, much improvement may often be brought about. In cases of infantile paralysis due to spinal disease, the use of the slowly-interrupted galvanic current frequently proves very serviceable for a time when other forms of electricity fail, but as the muscles improve in their action faradization becomes most efficacious.

(3.) *Local*.—Should a nerve be completely destroyed in its course, and electric contractility be quite extinguished, no improvement can be effected by electricity. In some cases, however, the morbid changes in the nerve disappear, but more or less paralysis persists from want of use. Here electricity is of great service, and it will be well in such cases to continue its application for some time, provided any contraction can be excited. In certain cases of local paralysis from lead, cold, and other causes, the use of a slow galvanic current has most effect upon the muscles, as has been previously explained. Under such circumstances, therefore, this current should be used at first, and a gradual change made to faradization as improvement is perceived.

A few special remarks are needed with reference to the treatment of *facial paralysis* from exposure to cold. The local application of heat and moisture constantly, leeching, and steaming, are the measures which are most useful at first; followed by blistering, friction with stimulating liniments, and the employment of the slow galvanic current. Iodide of potassium, quinine, or strychnine act beneficially in some cases, when given internally.

CHAPTER LIV.

DISORDERS OF SENSATION.

ALL forms of sensation may be more or less impaired or lost; exalted; or perverted. In the present chapter it is only intended to consider the most important deviations noticed in connection with ordinary Sensation.

I. SENSORY PARALYSIS—HYPÆSTHESIA—ANÆSTHESIA.

Sensation may be more or less impaired—*hypæsthesia*; or completely lost—*anæsthesia*. Generally it involves the whole thickness of the tissues of the part affected, but may be confined either to the skin or to the muscles. Anæsthesia may be gradually established, sensation becoming more and more impaired; or it may occur suddenly. When this condition exists, the patient is wholly insensible as regards tactile sensations, and may be pinched, pricked, cut, or injured in any other way without being aware of it. In hypæsthesia the sense of touch is

more or less indistinct, and the patient feels as if a thick layer of some soft and yielding material, such as cotton-wool or flannel, intervened between the skin and anything brought into contact with it. This is especially noticed in connection with the hands and feet, when the patient grasps anything or stands. In this condition also, as well as during the development of anæsthesia, various unusual sensations or *paræsthesiæ* are often experienced, such as numbness, formication, tingling, or pins and needles. In some cases even of complete anæsthesia to objective impressions, neuralgic pains of a subjective character are complained of in the affected part. It is a curious fact that in exceptional cases, although tactile sensation is lost, the power is retained of distinguishing differences in temperature, or of feeling painful impressions. Occasionally, in connection with marked hypæsthesia, the impression of anything brought into contact with the affected surface seems to be delayed in its passage to the nerve-centre, so that it may be some seconds before the patient is conscious of it. There is often in this condition great difficulty in distinguishing different sensations from each other. With regard to muscular sensibility, when this is lost there is almost always loss of muscular contractility, but in exceptional instances this is unimpaired. In cases of cutaneous anæsthesia reflex irritability may be destroyed, normal, or increased, according to the cause of the loss of sensibility. The distribution of sensory paralysis presents the same variations as in the case of motor paralysis. Thus it may be:—1. **General.** 2. **Unilateral—Hemi-anæsthesia.** 3. **Bilateral,** but affecting only the legs and the lower part of the body. 4. **Disseminated.** 5. **Local.** The ætiology of the two kinds of paralysis is also very similar, and it will only be necessary to allude briefly to the more frequent varieties of sensory paralysis, but it may be remarked that all forms are not uncommonly associated with functional diseases, especially hysteria.

1. **Hemi-anæsthesia,** when present, is usually the result of some cerebral lesion, but in a large number of cases of hemiplegia from this cause sensation is intact; or it may be impaired at first, but is speedily restored. Moreover, in cerebral hemi-anæsthesia sensation is not as a rule completely lost, or it may be retained in certain parts, or the anæsthesia may be irregularly distributed. The lesion generally implicates the optic thalamus or the white substance in its immediate vicinity, but may be situated in the posterior portion of the cerebral convolutions. In rare instances hemi-anæsthesia results from disease of one lateral half of the spinal cord, the loss of sensation being on the side opposite the lesion.

2. **Bilateral anæsthesia,** involving the legs and lower part of the body, is almost invariably associated with paraplegia, and is due to disease or injury of the spinal cord. Sensation is, however, more or less retained in many cases where the power of motion is completely lost.

3. **Local anæsthesia** is generally due to disease of some special nerve, or of its nucleus of origin, its seat varying accordingly. It might possibly be associated with localized disease affecting certain of the posterior convolutions of the brain. When a particular nerve is paralyzed, if it is a compound one, sensation and motion will be equally impaired. One of the best illustrations of paralysis of a purely sensory

nerve is that of the *superior maxillary*, or of its continuation the *infra-orbital*; sensation is then lost in the parts to which this nerve is distributed, and when the patient attempts to drink out of a glass or cup, a very curious feeling is experienced, as if the vessel were broken opposite the middle of the upper lip. Nutrition and secretion are frequently seriously interfered with when sensory nerves are paralyzed.

TREATMENT.—The general remarks made as to the treatment of paralysis of motion apply equally to that of sensation. Local warmth, friction, and electricity are often useful. The latter must not be resorted to for some time in cases of anæsthesia or hypæsthesia from cerebral causes, and even then only very cautiously; it does not lead to much improvement in most of these cases. Faradization with a brush acts best. Electricity is often very beneficial in various forms of sensory paralysis met with in hysteria, either faradization or franklinic electricity being employed, the latter by directing sparks on to the affected part; charging this part and then drawing sparks from it; or applying a small charge from a Leyden-phial. If sensibility is lost locally from destruction of a nerve, no benefit can be anticipated from electricity. When motor and sensory paralysis are combined, electrical treatment directed to the former may improve the latter at the same time. Particular care is necessary in cases of sensory paralysis as regards cleanliness and avoidance of pressure.

II. HYPERÆSTHESIA—DYSÆSTHESIA.

Hyperæsthesia signifies increased or exalted sensibility, *dysæsthesia* increased sensibility to painful impressions, but they are almost always associated. These deviations from the normal state are usually local, but occasionally unilateral or disseminated. They are of course frequently met with in diseases of the skin and other affections, but as regards nervous diseases, they are generally associated either with hysteria or general nervousness, or with acute inflammation involving the nerve-centres or special nerves. When one leg is paralyzed from spinal disease, its sensibility frequently becomes painfully acute.

III. NEURALGIA.

Neuralgia or nervous pain is a comprehensive term applied to certain painful affections occurring in different parts of the body, the pain appearing to follow the distribution of particular nerves, and having special characters. It will be convenient first to consider the general ætiology, pathology, and clinical features of the complaint; and then to allude briefly to its principal varieties.

ÆTIOLOGY AND PATHOLOGY.—In a large proportion of cases neuralgia is distinctly dependent upon some *general* or *constitutional* condition. The causes which may give rise to such a condition are:—
1. Exposure to malaria. 2. The presence of certain metallic poisons in the system, as lead, mercury, or copper. 3. Whatever tends to induce anæmia, or general mal-nutrition and debility. 4. Various

causes which lead to depression and weakness of the nervous system, such as prolonged worry and anxiety; undue mental exertion; strong emotion; general concussion of the nervous system, as from a railway collision; hysteria; excessive fatigue; exposure to heat; ennui and luxurious habits; or excessive venery. 5. Degenerative changes associated with the decay of life; and those which precede the onset of locomotor ataxy. 6. Rheumatism, gout, syphilis, or exposure to cold and wet. In the case last-mentioned, however, neuralgia is probably mostly the result of inflammatory and other changes in the nerve itself; or of pressure by surrounding thickening of fibrous membranes, or by morbid deposits.

An important group of causes of neuralgia are *local* in their action, including:—1. *Injury* to a nerve in some part of its course, as from contusion; wound by a needle; partial section; the lodgment of a foreign body, such as a piece of glass, when the pain may be felt in some distant part. When a nerve is completely cut across, either itself or some other nerve related to it now and then becomes subsequently the seat of neuralgia. 2. *Pressure* upon a nerve, *e.g.*, by foreign bodies, such as a bullet; cicatricial thickening or old adhesions; neuromata; tumours, aneurisms, or enlarged glands; callus uniting fractured bones; congested veins; or as the result of prolonged sitting, tight boots, or hanging the arm over a chair. 3. *Irritation* of a nerve by necrosed bone, especially when it passes through a foramen or canal in this condition; by carious teeth; by surrounding inflammation or ulceration; or by direct exposure to a cold draught. Even when neuralgia is local in its origin, its occurrence is greatly influenced by the general state of the system, and Anstie went so far as to affirm, "it is universally the case that the existing condition of the patient at the time of the first onset of the disease is one of debility, either general or special." Among the chief *predisposing causes* of neuralgic affections may be mentioned the female sex; certain periods of life, especially that of sexual development, and about or beyond middle age; hereditary tendency to nervous affections; and a nervous temperament. An acute attack is predisposed to or intensified by fatigue or any other lowering influence. It may come on quite spontaneously; or be brought about by mental disturbances, pressure, cold, heat, over-exercise, and numerous other influences.

Pathologically neuralgia may be connected with some evident morbid change in the affected nerve or in the nerve-centre, but as a rule no such obvious change can be detected. Probably in some cases the nerve is more or less congested or inflamed. Marked atrophy with degeneration of a nerve has been found in connection with neuralgia from pressure, occasionally so advanced as to render sensation almost extinct. Anstie remarked "I think it most probable that in *all* cases of neuralgia there is either atrophy, or a tendency to it, in the posterior or sensory root of the painful nerve, or in the central grey matter with which it comes in closest connection."

SYMPTOMS.—*Pain* is the essential symptom of neuralgia. The important characters of this pain are as follow:—1. It is almost invariably unilateral. 2. In recent cases it is distinctly *intermittent*, coming on in more or less sudden paroxysms, usually at irregular intervals, but

occasionally at regular periods, especially in malarial cases; later on it is only more or less remittent. 3. The pain during the paroxysms is generally severe, in some cases most excruciating, being described by such terms as stabbing, piercing, boring, burning, or screwing, at the same time shooting out from a point along some of the branches of the nerve affected, but rarely along all of them; the darts, twinges, or "tics" in some instances come on with the suddenness of an electric shock, giving rise to intolerable agony. The pain may extend to contiguous or even to distant nerves. Frequently strong pressure over the chief point affords relief; in other cases gentle friction has the same effect; in others, however, there is exquisite tenderness. The paroxysmal pain often ends as abruptly as it commenced, with a sense of extreme relief and comfort. The pain in the intervals is much less severe, of dull or aching character, and in the superficial neuralgias presents circumscribed points of tenderness—*points douloureux*, corresponding to the exit of branches of the nerve through bony foramina or through openings in fibrous membranes, though they appear to the patient to be diffused beyond these spots, in some cases giving the sensation of tolerably extensive contusions. It is not practicable in a treatise like this to indicate the seat of all the tender spots noticed in the different local neuralgias, but a knowledge of the distribution of the nerve affected, and of the points at which its branches become superficial, will enable their situations to be recognized.

There are certain general facts relating to neuralgia to which it is desirable to allude. When the complaint is *local* in its origin, the pain usually sets in more gradually; is more constant; and is less capable of relief. In advanced age neuralgia is commonly very severe and intractable, the points of tenderness being often intensely painful. Once an attack has happened, there is always a liability to its recurrence, and the paroxysms may be repeated at regular periods. An individual may have had neuralgia when young, and then be quite free from it for many years, but be again subject to the complaint at a later period of life. Different nerves may be implicated in different attacks, or even during the same attack.

Some interesting *complications* are often associated with neuralgia, affecting either sensation or motion; the state of the vessels; or nutrition and secretion. The chief of these which have been noticed include local hyperæsthesia, hypæsthesia, or paræsthesiæ, such as numbness, tingling, or formication; disturbances of the special senses, especially that of sight; spasmodic twitchings, tonic spasms, convulsive movements, or even local paralysis; pallor, followed by redness of the skin, pulsation of the arteries, increase in temperature, and swelling of the affected part, with subcutaneous œdema; hypertrophy or atrophy of the tissues in prolonged cases, or increase of adipose tissue; increased firmness, falling-off, or whitening of the hair; the breaking out of skin-eruptions, such as herpes zoster or acne; increased vascularity of the conjunctiva, conjunctivitis, iritis, and other morbid conditions of the eye; periostitis; swelling or unilateral furring of the tongue; erysipelatoid inflammation of the tissues to which the affected nerve is distributed; impaired gastric secretion; increased flow of saliva or tears; and local increase of perspiration.

VARIETIES.—Neuralgias are primarily divided into:—I. **Visceral**, including, 1. *Cardiac*. 2. *Hepatic*. 3. *Gastric*. 4. *Peri-uterine and Ovarian*. 5. *Testicular*. 6. *Renal*. II. **Superficial**, viz., 1. *Tic-douloureux*. 2. *Cervico-occipital*. 3. *Cervico-brachial*. 4. *Intercostal*. 5. *Mastodynia or Irritable breast*. 6. *Lumbo-abdominal*. 7. *Sciatica*. 8. *Crural*. The *visceral* group will not be further alluded to, the most important of these affections having been already considered under their respective organs. The names applied to the several forms of *superficial* neuralgia will indicate their respective localities, but a few need special comment.

1. **Tic-douloureux—Brow-ague—Prosopalgia.**—This is one of the most common forms of neuralgia, the *fifth* or *trigeminal nerve* being involved. Rarely are all the divisions implicated, and it is the ophthalmic branch which is most frequently affected, the pain, therefore, being chiefly felt above the orbit and about the temple. Numerous points of tenderness are described, but the most important are the *supra-orbital* and *parietal*, the latter being situated just above the parietal eminence, and corresponding to the inosculation of several branches. A variety of this neuralgia is named *clavus hystericus*, in which there is extreme pain, in character as if a nail were being driven into one or more spots, usually corresponding to the supra-orbital or parietal points.

2. **Intercostal Neuralgia.**—In this variety the pain is felt along the course of one or more intercostal nerves. Those on the left side, especially from the 6th to the 9th, are most frequently affected. There is a constant pain, mostly corresponding to the point of exit of a lateral cutaneous nerve, and increased by a deep inspiration or cough, or sometimes by moving the arm. Shooting pains are also experienced at intervals, extending from the spine along the intercostal spaces, or from the lateral point backwards and forwards. Three very distinct “points douloureux” can generally be detected, viz., *a. Vertebral*. *b. Lateral*, opposite the lateral cutaneous branch. *c. Sternal* or *epigastric*, where the anterior cutaneous nerve perforates. This variety of neuralgia is very common in anæmic and chlorotic females. It also frequently precedes herpes zoster, and a very severe and obstinate form is liable to follow this affection in old people. For the diagnosis of the pain of intercostal neuralgia from that of pleurodynia or pleurisy, the condition of the patient; the want of connection of the pain with any excessive or prolonged exercise of the local muscles, of any marked exacerbation from their use; or of relief from rest; the characters of the pain, with the points of tenderness; and the results of physical examination, are generally quite satisfactory. The appearance of an eruption of herpes is pathognomonic.

3. **Sciatica or Hip-gout** are the names applied to neuralgia in the course of the branches of the sciatic and other nerves about the hip. Generally the pain is mainly seated in the posterior and outer part of the thigh, but it may affect various parts of the lower extremity, even down to the leg or foot. There is generally a persistent and deep pain near the tuberosity of the ischium, which is increased paroxysmally, shooting upwards or downwards, either without any cause, or as the consequence of pressure, movement, especially a sudden jerk, or even the act of coughing. The patient is often obliged to walk very

carefully, or may be unable to move at all. Local anomalies of sensation; spasmodic movements or cramps; and partial paralysis are very common in sciatica. Many cases of this affection are exceedingly severe, and will not yield to treatment. The limb may waste from want of use.

The *local* causes which most frequently give rise to sciatica are long-continued sitting; direct exposure of the buttock to a cold draught, as in using windy privies; and sitting on a cold or damp surface. Not unfrequently this complaint is associated with gout or rheumatism.

TREATMENT.—The general principles applicable to, and the chief remedies employed in the treatment of all forms of superficial neuralgia will now be briefly considered. 1. Any *local cause* of irritation must be removed. In regard to this point a word of caution is necessary respecting tic-douloureux. This complaint is often attributed to decayed teeth, and not unfrequently these are extracted one after another without any improvement resulting, for the simple reason that the neuralgia is not dependent upon this cause at all. 2. It is highly important that those who are subject to neuralgia should adopt measures to *prevent* attacks, by attending to diet and hygiene; wearing warm clothing; regulating the state of the alimentary canal; and, in short, promoting a state of good general health in every possible way, while at the same time they avoid every cause which is likely to bring on a paroxysm. 3. Treatment directed to the *general state* of the system, or to some *constitutional diathesis*, is in a large proportion of cases of the utmost consequence. Radcliffe and Anstie have shown the great advantage to be derived from the use of fatty elements when nutrition is impaired, especially cod-liver oil or Devonshire cream. Iron in anæmic subjects; quinine in full doses, especially in malarial neuralgias; arsenic in the form of Fowler's solution; strychnine or nux vomica, are among the most valuable remedies for neuralgia. In some instances valerianate and other salts of zinc, or nitrate of silver prove serviceable. Phosphorus has been found highly beneficial in many cases. Should the neuralgia be associated with gout, rheumatism, syphilis, or the presence of some metallic poison in the system, treatment directed against such a condition is essential. 4. An important class of remedies in the treatment of neuralgia are those which have a direct *sedative* effect on the nervous system, including mainly opium or morphia; belladonna; cannabis indica; hydrate of chloral; croton-chloral; bromide of potassium; conium; atropine; tincture of aconite; veratria; and ammoniac chloride in full doses. Two drugs stated to be very efficacious are eucalyptol, which is an essential oil derived from the *Eucalyptus globulus*; and the tincture of *gelsemium sempervirens*. These medicines are either given by the mouth; or applied to the affected part in the form of plasters, liniments, ointments, oleates, or tinctures; or, above all, some of them are introduced by subcutaneous injection, particularly morphia and atropine. They are not merely to be used for the temporary relief of pain, but are in many instances most important agents in bringing about a cure, if employed systematically and regularly every day for such a period as each case may require. In using subcutaneous injections, it is best to begin with a very small dose—gr. $\frac{1}{10}$ to $\frac{1}{8}$ th of morphia, increasing it as occasion requires, some cases needing

large quantities after a time. As a rule the injection need not be made at the seat of pain, but Anstie recommends that this should be done in advanced cases where there is much hyperæsthesia, and where there is reason to believe that much thickening and hypertrophy exist about the nerve. If necessary, the sensibility may be first blunted by the ether spray. The use of *alcohol* demands brief notice. There can be no doubt but that the pain of neuralgia may often be temporarily lulled by the use of alcoholic stimulants, but experience has convinced me that we should hesitate in recommending them, as there is in this complaint a strong tendency on the part of the patient to be taking stimulants at frequent intervals and in increasing quantities, so that the foundation may be laid for confirmed habits of intemperance. 5. Certain *anodyne local applications* have already been alluded to above, the most useful being liniment or plaster of belladonna or opium; tincture of aconite; ointment of aconite or veratria; and a liniment containing eucalyptol. Among other local remedies which may be serviceable are dry heat, or heat with moisture; chloroform liniment; sinapisms; flying blisters; and light linear cauterization. In obstinate cases blistering and even stronger forms of counter-irritation may be required. Cold is useful in some cases, in the form of ice or evaporating lotions, and I have found much benefit follow the application of the ether spray over the seat of pain for a few minutes three or four times daily. A most valuable local method of treatment is that by electricity. The constant galvanic current is decidedly the best as a rule, but sometimes faradization acts beneficially, or merely charging the patient from a friction-machine, or afterwards drawing a spark from the seat of pain. In employing galvanism, it is necessary to use only a very weak current, especially about the head, carefully guarding against giving rise to unpleasant head-symptoms; to apply it by well-wetted sponges in the direction of the nerve, the positive pole being placed over the seat of pain; and not to make the application for too long a time, but with frequent repetitions. Surgical interference has been had recourse to in very obstinate cases of neuralgia, the nerve having been divided, or a piece of it cut out. This treatment is rarely followed by any permanent good results.

CHAPTER LV.

APHASIA—APHEMIA—AMNESIA.

DISORDERS relating to speech and the use of articulate language, as well as to reading and writing, constitute important clinical phenomena, which at the present day have been much studied in nervous diseases, and the terms given above are used to express the chief deviations from the normal state which are observed with respect to written and spoken language as an intellectual act. There are two classes of causes which interfere with the proper employment of articulate language, which are not recognized under these terms, and which must be excluded at the out-

set:—1. There may be complete mental incapacity and loss of intellectual power, so that no ideas are originated in the mind which the individual wishes to convey, as in the case of idiots. 2. There may be merely a difficulty or even an impossibility of performing the mechanical act of articulation, owing to more or less paralysis of the parts necessary for this act, namely, the tongue, lips, and palate; the power of thought, and also of expression, as evidenced by the ability to write sensibly, being perfectly natural. This is observed in certain cases of hemiplegia, general paralysis of the insane, glosso-labio-laryngeal paralysis, some cases of locomotor ataxy, chorea, and other affections. The exact form of the deviation differs in the several conditions, and it must be remembered that paralysis of articulation may accompany true aphasia.

Coming now to the consideration of the various phenomena presented by cases grouped under the term *aphasia*, it may be remarked that, although as a rule the mental condition is more or less impaired, it is not so much so as to prevent the formation of ideas, but the patient cannot recollect words or their meaning, and thus is unable to express his thoughts; or has lost the power of co-ordinating and arranging them in a proper manner, for purposes of articulate or written language. In its strict sense aphasia merely refers to disorders of *speech*, but it is now usually employed in a general sense, to include all the different forms of derangement which come under the group now under consideration, and the special use of the other terms mentioned will be presently indicated. It must be remarked that in all forms of aphasia, phonation or the power of producing vocal sounds is retained more or less.

PATHOLOGY.—The conditions recognized as aphasia are in the large majority of cases associated with *right* hemiplegia, and are due to some lesion in the left cerebral hemisphere, involving the region which the left middle cerebral artery supplies. It is more particularly with *embolism* of this artery that they are connected, as was first pointed out by Dr. Hughlings Jackson; but they may depend upon hæmorrhage, softening, cerebral tumour, and other lesions, and I have known them arise temporarily apparently from mere vaso-motor disturbance. With regard to the exact localization of the mischief, some writers maintain that there must be an injury to some part of the corpus striatum, or of certain motor nuclei or inter-communicating fibres in its neighbourhood. Niemcyer partly attributed the frequency of aphasia in connection with diseases in the region above indicated to the fact that pressure acting on one side in this region is readily propagated to the opposite one, so that the brain becomes bilaterally disordered. Most authorities now, however, agree with Broca, in regarding the third left frontal convolution as being the seat of the faculty of articulate language, and in referring the disorders met with in most cases of aphasia to some lesion affecting specially the posterior third of this convolution. When both sides are involved, paralysis of articulation may be observed along with aphasia, as in a case reported by Dr. Barlow. There is one form of aphasia, named *aphemia*, in which the patient is quite speechless, which is supposed to depend upon disorder of a special co-ordinating centre, situated somewhere in or below the corpus striatum, whose assumed function is to regulate or combine the

groups of movements necessary for the production of elementary articulate sounds, it being so placed as to receive the communications from the intellectual centre of language above, and to transmit them to the nuclei of origin of the motor nerves below, by which they are conducted to the muscles of articulation. Any lesion affecting this centre, or cutting off its communication either above or below, may, it is presumed, lead to speechlessness. No special morbid condition, however, has been definitely associated with this form of aphasia.

SYMPTOMS. --The phenomena included under the term *aphasia* are somewhat variable, and it is necessary to point out briefly the chief diversities observed in different cases in actual practice.

In one rare group, to which Bastian would limit the term *aphemia*, the patient is completely speechless, even after having regained the use of every other faculty which has any relation to speech. He is able to write, and retains all his mental faculties; while there is no paralysis of the muscles of articulation, for these can be used perfectly for all other movements. *Aphemia* has been noticed after epileptic or apoplectic fits. Several years ago I had under my observation a case which was probably of this kind. The patient was a young girl who, after a sudden fit of insensibility, was found on recovering consciousness to be suffering from right hemiplegia and complete mutism. She recovered the use of the leg entirely, but the arm remained permanently paralyzed, and even at the end of some years there was no sign of returning speech. The case was supposed to be one of embolism.

In another class of cases there is a loss of memory of words or even of letters, this condition being termed *amnesia*. This is almost always accompanied with impaired power of recalling facts, and of conducting mental operations; but there is no necessary relation between these defects, and amnesic patients are often quick in perception and intelligence, obviously understanding everything said to them. The amnesic condition is evidenced in the speech, reading, and writing, and presents the widest differences in the degree of its manifestations, though the power of articulation and of writing are perfectly retained. With regard to speech, as examples of the disorders to which this act is liable may be mentioned the use of only one or two inarticulate sounds, words, or phrases, or of a few words or expressions, which the patient tends to repeat; the use of wrong words in sentences, and loss of memory as regards the names of things and persons, which are wrongly applied; forgetfulness of the names of letters; the occasional misuse or omission of certain words or letters; the employment of wrong endings or beginnings of words; or the transposition of syllables or letters. The patient may repeat words which have been uttered immediately before, but speedily forgets them. Individuals who are almost completely amnesic may utter words or expressions under the influence of powerful emotions. Some of these disorders are often recognized when the patient attempts to read, though some patients can read distinctly enough, but are unable to compose sentences for themselves, even sufficient to answer the simplest question. With respect to writing, though this act can be done from a copy, provided the patient is not suffering from right hemiplegia, he generally cannot write correctly out of his own head or from dictation.

Those who can write, occasionally write sense, frequently nonsense, but more frequently either unintelligible characters, or distinct but unconnected words (Reynolds). They may copy from printed matter, and yet not have the slightest idea of the names or meaning of the letters or words. Occasionally they can write down figures from dictation when they cannot put down words, and may even be able to do simple arithmetical sums.

In some cases of aphasia there is a combination of amnesia and aphemia. These conditions may also be associated with actual paralysis of articulation.

TREATMENT.—There is no special treatment for the various aphasic conditions, and this must be directed to the disease with which they are associated. In cases of aphemia, it may be possible to teach lip-speech, according to the manner in which deaf-mutes are instructed.

CHAPTER LVI.

ON SECONDARY AND TROPHIC LESIONS IN NERVOUS DISEASES.

OF late years much attention has been paid to the study of the lesions which arise in the course of organic cerebro-spinal nervous diseases, both in the nervous structures themselves, and also in various other tissues of the body. Sufficient is now known in relation to this subject to make it worthy of special consideration, and therefore I have thought it desirable to devote a short chapter to its discussion, though further illustrations bearing upon it will be hereafter given in connection with particular diseases. For our knowledge respecting these lesions we are greatly indebted to Charcot, from whose valuable "Lectures on Diseases of the Nervous System"* most of the information here given has been obtained. The conclusions arrived at have been determined by experiments on animals; as well as by clinical and pathological investigation.

1. With regard to the nervous system itself, secondary degenerative changes are liable to follow various localized lesions affecting either the centres or the nerves, and extending upwards, downwards, or horizontally, hence named *ascending*, *descending*, and *collateral* lesions. Various additional symptoms are consequently developed in the course of nervous diseases. If hæmorrhage takes place into one of the cerebral hemispheres, especially involving the corpus striatum, the motor tract proceeding therefrom is liable to undergo gradual degeneration in a descending direction, involving in succession the crus cerebri, anterior pyramid, thence passing to the opposite side of the spinal cord, and finally proceeding downwards chiefly along the posterior part of the lateral white column. The same result may follow other lesions. As

* "New Sydenham Society's Works." Vol. LXXII.

has been already mentioned, this probably accounts for the "late rigidity" observed in certain cases of hemiplegia. In the spinal cord, if a lesion occurs in some part of its length, it may extend both upwards and downwards, the ascending degeneration being confined to the posterior column, the descending to the lateral column. When the lower end is involved, the changes are liable to extend in an upward direction along the posterior column, especially those portions which lie contiguous to the posterior median fissure. The degeneration may also proceed horizontally, either from the original seat of disease or from the secondary lesions, and then the anterior cornua and their motor nuclei are particularly implicated.

With reference to the influence of affections of the nerves, more or less serious phenomena are attributed to irritation excited by lesions of the sensory nerves upon the nerve-centres. Thus it is believed by many authorities that centric irritation induced in this manner may account for certain grave diseases, such as tetanus. If the anterior root of a spinal nerve is in any way divided, degeneration extends along its peripheral or distal portion; while if the posterior root is cut, the change proceeds along the portion still in connection with the cord.

2. The effects of diseases of various parts of the nervous system upon the nutrition of other structures are often very striking. They may be observed in connection with lesions of nerves or of nerve-centres, and have been found more especially associated with the skin and subcutaneous tissues, the muscles, the joints and bones, and certain internal viscera, especially the kidneys and bladder. It has long been known that muscles may waste in paralyzed parts from mere prolonged inaction and disuse, and may undergo more or less fatty or other degenerative changes; and that in structures deprived of sensation inflammation, ulceration, or gangrene may arise, due merely to the fact that in consequence of the loss of sensibility the patient is unconscious of pressure, of the contact of mechanical irritants or irritating excretions, and of other deleterious influences, and thus is unable to prevent them from injuring the tissues. This is well illustrated by the bed-sores which are liable to form in persons suffering from spinal disease, with complete paralysis of the lower extremities. The trophic lesions now to be considered are not, however, thus explicable, but are due to irritative or inflammatory lesions of different parts of the nervous system, the nature of which will be presently pointed out.

As regards the character of the consecutive changes in the several structures, in the skin and subcutaneous tissues, they are either of an inflammatory or an atrophic nature, and are evidenced mainly by erythematous redness, which may be combined with tumefaction of the skin and subcutaneous tissue, simulating phlegmon; vesicular and bullous, or sometimes pustular skin-eruptions, such as herpes, pemphigus, ecthyma, &c.; glossy skin; and acute gangrene ending in bed-sores. The muscles undergo acute wasting, more or less complete loss of electric contractility occurring with equal rapidity. These effects are due to an inflammatory process, which is evidenced by hyperæmia and hyperplasia of the interstitial connective tissue, with multiplication of the nuclei of the sarcolemma, the muscular fibres being involved as a consequence of these changes, becoming gradually more and more

attenuated, but rarely if ever losing their striated appearance or undergoing fatty degeneration. In connection with the joints, the morbid conditions which have been noticed are acute or subacute inflammation or synovitis, which often ends in ankylosis; or sudden attacks attended with more or less diffused swelling of the limb, but with little or no pain, and ending in the rapid destruction and erosion of the cartilages and articular ends of the bones, which may lead to dislocation. Occasionally periostitis occurs, which often terminates in necrosis. Trophic lesions in the viscera resulting from nervous diseases are mainly exemplified by rapidly-developed inflammation of the kidneys and bladder, accompanied with the discharge of ammoniacal and foetid urine, containing blood or pus.

It is necessary now to point out the relation of the different portions of the nervous system to these consecutive lesions.

a. Nerves. Brown-Séquard attributes to reflex influence through centripetal nerves, the occurrence of cutaneous eruptions and muscular wasting in some cases; and many pathologists regard various forms of internal inflammation as being due to a similar influence. Certain lesions of motor nerves are followed by rapid reduction of electric contractility, and corresponding atrophy in the muscles which they supply. In connection with diseases of sensory nerves, the different forms of skin-eruption are liable to arise, which is well exemplified by herpes zoster; and also gangrene or atrophic lesions. In anæsthetic lepra atrophy of the muscles occurs; and erythematous patches appear on the skin, followed by the development of vesicles or bullæ, or by atrophy of the cutaneous tissues, and in some cases leading to gangrene of the skin, of the deeper soft structures, or even of the bones.

b. Spinal cord. Numerous consecutive lesions are liable to follow various diseases of the spinal cord. Thus, in affections involving the posterior columns, such as locomotor ataxy, several skin-eruptions are liable to occur, owing, it is supposed by Charcot, to the implication of the nerve-fibres passing through the outer part of these columns before they emerge from the cord. These may also be observed in connection with a form of inflammation of the meninges of the cord, which leads to compression and irritation of its structures, as well as of the roots of the sensory nerves. Bullæ are sometimes developed in various parts in cases of vertebral caries. Bed-sores form at a very early period and with great rapidity in some cases of paraplegia, appearing only on the paralyzed parts, and especially over the sacral region, hence usually occupying a somewhat central and symmetrical site. They are also sometimes seen on the heels, the hips, and inside the knees. They occur more especially where pressure is exerted, but may be independent of this cause, or of any irritation by the excretions. At first patches of erythema are observed, with more or less infiltration and congestion of the subjacent tissues, which may involve the muscles and bones. Soon vesicles or bullæ form, and superficial sloughing takes place, gradually extending in area and depth, until a large surface may be destroyed, muscles and bones being sometimes involved, and even cavities opened up. These lesions are necessarily very grave, having been mainly observed in connection

with hæmorrhage or inflammation occupying a considerable extent of the central portion of the spinal cord, and they may thus be associated with injuries to the spinal column, or with acute exacerbations and complications of chronic diseases of the cord. The lesions of the cutaneous tissues just considered are supposed to be due to implication of the posterior cornua and central grey matter of the spinal cord.

More or less rapid loss of electric contractility in muscles, with corresponding wasting, may follow many injuries and diseases of the spinal cord, if they involve certain special parts of the anterior cornua, including those groups of multipolar nerve-cells from which the motor fibres arise which proceed to the affected muscles. Even diseases which begin in other columns, such as locomotor ataxy, may by lateral extension involve the anterior cornua at different points, and thus induce disseminated atrophic changes in the muscles. They are also seen in connection with diffuse inflammation or hæmorrhage into the cord, but are particularly associated with infantile paralysis and corresponding conditions in the adult. Joint-affections are also sometimes observed in cases of injury or disease of the spine, and that form in which rapid destruction takes place chiefly occurs in cases of locomotor ataxy. These arthropathies are not uncommonly combined with rapid muscular wasting, and it is supposed that the two classes of morbid changes are connected with lesions affecting the same parts of the cord.

It is in certain cases of paraplegia from spinal disease that acute inflammation of the kidneys and bladder takes place, supposed to be of the nature of a trophic lesion.

c. Brain. In cases of hemiplegia, erythematous, vesicular, or pustular eruptions occasionally occur on the paralyzed limbs. Acute bed-sores, similar to those described in connection with the spinal cord, may also occur in these cases, more particularly if the hemiplegia is due to cerebral hæmorrhage. They are almost always observed about the centre of the buttock on the paralyzed side, and at a lower level than those associated with paraplegia. These lesions in cerebral diseases are supposed to be due to irritation of the ganglia at the base of the brain. Acute muscular wasting, with loss of electric contractility, is rare in connection with cerebral disease, and is probably always due to some secondary descending lesion of the spinal cord, involving the motor nuclei. Inflammation of joints is occasionally noticed in hemiplegia, especially if due to softening, usually only affecting the articulations of the upper limb.

PATHOLOGY.—Having now noticed the relation of the chief trophic lesions to the different parts of the cerebro-spinal nervous system, it remains only to offer a few observations as to the explanation of their occurrence. They are not due to mere abolition or suspension of the action of the parts of the nervous system with which they are severally associated, but they are always dependent upon some kind of irritation, which leads to inflammation. Thus, in the case of the nerves, it is not complete nerve-division which causes the lesions, but those injuries by which the nerve is contused, punctured, incompletely divided, or lacerated; or diseases in which a nerve is inflamed, compressed, or stretched. Again, as regards the brain and spinal cord, some irritation

of an inflammatory nature in connection with the nerve-cells which are related to the different parts involved in different cases, induces the trophic changes, and not the mere severance of the nervous connection between them. What the precise cause of the lesions may be is at present undecided, but they have been supposed to be associated with certain trophic nerves ; or to be excited through the vaso-motor nerves, which influence the vessels, leading to neuroparalytic hyperæmia, or setting up an irritative affection. Charcot thinks that some of the consecutive changes may be due to the transmission of pathological irritations from their original seat in a centrifugal direction along the nerve-filaments, these irritations thus reaching various structures, in which they originate the trophic lesions.

CHAPTER LVII.

ON THE LOCALIZATION OF NERVOUS DISEASES.

THE localization of the phenomena presented in various nervous diseases, whether functional or organic, has of late years come to occupy a prominent position with reference to the diagnosis of this class of affections, and it is now recognized as one of the objects to be kept in view in making such a diagnosis, to associate these phenomena with particular portions of the nervous system. The knowledge which renders this practicable is partly founded upon anatomical investigations, by which the structure and connections of the different parts of the nervous system have been determined. It has been mainly obtained, however, as the result of physiological experiments, which have greatly increased our information as to the functions of this system, by indicating the effects of irritation and destruction of its several parts. Some assistance has been derived from observing what portions of the nerve-centres are deficient in their development when a limb or a part of it is either congenitally wanting, or has been amputated. Lastly, the observation of the actual phenomena associated with injuries and pathological changes affecting the nervous structures has contributed much to our knowledge, and the mass of material thus accumulated for our guidance is being daily added to by several workers in this field of pathology. Within certain limits the diagnosis of the localization of nervous diseases is not only important, but essential ; at the same time it must be remarked that the extreme accuracy in this respect which is now aimed at by many of those who make these affections their special study, is more a matter of scientific than of practical interest, and there are several circumstances which render it very difficult to arrive at a positive opinion as to the precise localization of the lesion in a large number of cases. It will be expedient, before discussing the individual diseases of the nervous system, to

consider the subject in some detail, and to point out the main facts at present known which bear upon it.

1. In the first place it is always essential to distinguish between affections of the *brain*, *spinal cord*, and individual *nerves*; or, in other words, to determine whether a nervous disease is *cerebral*, *spinal*, or *peripheral*. To localize the mischief thus far is usually not difficult, but it must be borne in mind that the brain and spinal cord may be involved simultaneously; and that special nerves may be implicated along with the nerve-centres.

When the *brain* is affected, the special clinical phenomena which, in different combinations, are to be looked for as pointing to this portion of the nervous system, are as follows:—*a. Morbid sensations* referred to the head, and occasionally evident objective changes, affecting its size or shape. *b. Disturbance of the mental faculties.* *c. Subjective disorders of the special senses.* *d. Signs of derangement of the functions of the cranial nerves*, either in the direction of irritation or paralysis. *e. Motor phenomena* referred to the limbs, and sometimes to the body, usually unilateral in distribution; sometimes localized, but then as a rule limited to one side; occasionally general, affecting more or less both the upper and lower limbs, as well as the trunk. Hemiplegia is very common in cerebral diseases. *f. Sometimes disorders of sensation of corresponding distribution*, though these are by far less common, as well as much less in degree. *g. Changes in the eyes*, as observed with the ophthalmoscope. *h. Certain extrinsic symptoms*, especially cerebral vomiting, and obstinate constipation. When certain parts of the brain are involved, respiration and circulation are much affected; and curious symptoms are observed in particular cases.

Diseases of the *spinal cord* present considerable variations in their symptoms, according to the seat and extent of the mischief, but the usual phenomena noticed are of the following nature:—*a. Morbid sensations*, and occasionally abnormal *objective signs* referred to some portion of the spinal region, the sensations sometimes shooting from this region in various directions. *b. Motor disorders*, generally bilateral, and usually involving both legs and the lower part of the trunk, paraplegia being a frequent symptom in spinal diseases, the muscles of the legs presenting at the same time marked derangements as regards their reflex and electric excitability, or the limbs becoming rigidly flexed, while they often show a tendency to rapid failure of nutrition. In some forms of spinal mischief the prominent motor derangement is impairment or loss of the power of muscular co-ordination. *c. Sensory disorders*, of similar distribution to those affecting motion, sensation as well as motor power being often completely lost in the lower limbs and lower part of the body. *d. Derangements affecting the bladder and rectum*, indicated by retention of urine and its consequences, or incontinence; and inability to expel the fæces, which may accumulate in large quantity, or involuntary escape of fæces. *e. Sexual disorders*, in the direction of undue sexual appetite or constant priapism; or of impairment or loss of sexual power and desire.

Peripheral nervous disease is indicated by the localization of the phenomena to the region in which the particular nerve or nerves affected are distributed; these phenomena being either connected with

motion, sensation, or both, according to the functions which the involved nerves possess. It must not be forgotten, however, that local nervous symptoms may be the result of limited or commencing central disease, implicating the roots of nerves, or the portions of grey matter to which these severally correspond. In motor paralysis due to actual disease of a nerve or of its nucleus of origin, the muscles show a rapid tendency towards wasting and loss of electric irritability, as has been pointed out in the previous chapter.

2. Having thus far indicated the general distinctions between the effects of lesions of the brain, spinal cord, and nerves respectively, it now remains to consider how far the clinical phenomena observed in different cases can be relied upon for the localization of diseases in the principal parts of the nerve-centres.

a. With regard to the *brain*,* it is a well-known fact, that when hemiplegia occurs from any lesion involving one of the cerebral hemispheres, the paralysis is almost invariably on the side opposite the lesion, which is accounted for by the decussation of the motor tracts in the medulla oblongata. Brown-Séquard disputes the validity of this law, on the authority of two hundred cases, in which the paralysis was on the same side as the disease, but, presuming that these cases were free from fallacy, they are, as has been shown by Ferrier and others, explicable on anatomical grounds, for direct paralysis may occur, in consequence of the motor tracts not decussating, according to their usual arrangement. Therefore, it may be definitely stated that opposite paralysis is the rule in cerebral diseases, and thus far their localization can be determined, to the extent of referring the mischief to either lateral half of the brain.

When, however, we come to attempt to localize a lesion in particular parts of the brain, the question becomes much more difficult, and many eminent authorities maintain that it is impossible to do so with any certainty. There are several reasons to account for this. In the first place, it has as yet been by no means satisfactorily settled what are the precise functions of the several parts of the brain. Again, lesions frequently give rise not only to direct, but also to indirect symptoms, through their effects upon surrounding parts, as well as upon the entire brain. Moreover, lesions are often very extensive, or there may be more than one, in some cases there being even several distinct seats of disease. It is believed, too, that certain centres exert a compensatory action with regard to each other, so that when one is destroyed its functions may still be carried on by other centres. Secondary lesions are also liable to be set up, and these tend to complicate the phenomena observed. Notwithstanding these and other difficulties, however, it is possible in a considerable number of cases to refer symptoms to particular portions of the brain, and this we are enabled to do mainly through the experimental investigations of Fritsch and Hitzig, Ferrier, Burdon-Sanderson, Duret, and other physiologists; and the pathological and clinical investigations of Hughlings Jackson, Ogle, Charcot, Pituitus, Broadbent, Gowers, Dreschfeld, Dickinson, and numerous other workers, in this field of enquiry. In the following remarks it is in-

* For a full discussion with reference to this subject, the reader is referred to the recent work on "The Localization of Cerebral Diseases," by Dr. Ferrier.

tended to point out the phenomena associated with lesions of the principal parts of the brain, so far as they have been determined by these investigations.

The *convolutions* were formerly regarded as being entirely connected with psychical functions, so that, if there were any signs of mental disturbance, it might be concluded that the cortex of the brain was involved. That this portion of the brain is concerned with these functions is unquestionably true, but considerable lesions may be met with here, causing marked objective symptoms without any mental disorder, and this is attributed to the fact that when one hemisphere is destroyed, the mental processes may be carried on by the opposite one. On the other hand, lesions which cause mental derangement need not be accompanied with any objective phenomena. In cases of insanity it is presumed that the brain is always diseased, but often no distinct lesions can be discovered; and although various morbid changes have been observed in these cases, no definite relation has been found to exist between any particular lesion, as regards either its nature or locality, and any form of mental disorder. Of late years it has been shown that different regions of the convolutions have distinct functions, by which lesions affecting them can be localized. The *præ-frontal lobe* or antero-frontal region, roughly bounded by the coronal suture of the skull, may be the seat of extensive laceration or disease, either suddenly or gradually induced, without causing any objective phenomena, and indeed without any evident disturbance, either bodily or mental, especially if the lesion be unilateral; but in other cases, chiefly where the mischief is bilateral, psychical symptoms have been noticed, and marked mental deficiency has been found in connection with arrested development or atrophy of this lobe. By most authorities, as has been already stated, the faculty of articulate language is now regarded as being lodged in the posterior extremity of the third *left* frontal convolution, and hence any lesion involving this part is accompanied with aphasia, which is most frequently associated with right hemiplegia. If both sides are involved, there is also paralysis of articulation. The cerebral cortex presents a *motor* zone, destructive or irritative lesions of which are indicated respectively by muscular paralysis or spasm. This zone is said to include the bases of the three frontal convolutions, with those bounding the fissure of Rolando, viz., the ascending frontal, the ascending parietal, the postero-parietal lobule, and the internal surface of these convolutions or so-called paracentral lobule. If a destructive lesion affects this motor zone extensively, it causes complete hemiplegia of the opposite side; it is, however, differentiated into centres for movements of the arm, leg, facial muscles, eyes, &c., and when the lesions are correspondingly limited, various monoplegiæ are induced. The same remark applies to spasm, and if a convulsive seizure always begins in the same way, or if monospasms are frequently confined to one limb or a particular group of muscles, and especially if corresponding paralysis becomes subsequently developed, a lesion may be localized in a certain part of the opposite hemisphere with much precision. With respect to the particular centres for each part, the chief are indicated by Ferrier as follows:—for the arm, upper third of ascending frontal convolution; hand and wrist, upper parietal; leg and foot, postero-parietal lobule;

facial muscles, middle third of ascending frontal and base of second frontal; mouth and tongue, lower third of ascending frontal and base of third frontal; lateral movement of head and eyes, posterior third of upper frontal convolution and corresponding part of second frontal.

How far it may be possible to diagnose between hemiplegia due to general destruction of the motor area of the cortex, or to lesions situated in the interior of the brain, is a matter of doubt, and in many cases such a diagnosis cannot be made, merely judging by the clinical phenomena observed. The main points bearing upon this subject, as given in Ferrier's work, are as follows:—It is said that there is less difference in temperature between the paralyzed and non-paralyzed sides when the paralysis depends upon cortical than on central disease, and that it subsides more rapidly. Cortical lesions are most frequently indicated by fractional or dissociated paralysis, or by a succession of dissociated paralyses and monoplegiæ. A complete hemiplegia often resolves itself into a monoplegia; or a monoplegia becomes a hemiplegia by progressive advance of the disease to other motor centres, which is said to be very significant. Again, a monoplegia is very often associated with monospasm or early rigidity of the paralyzed limb, or of the muscles governed by the centres surrounding the lesion. Sometimes the paralyzed limb remains motionless, while convulsions occur in the others. Cortical paralysis is frequently erratic and transitory, more especially in connection with superficial or meningo-cerebritis. Lesions of the cortex are more frequently accompanied with localized pains in the head; and Ferrier has observed that even when pain is not spontaneously complained of, it may be brought out by percussion over the seat of lesion.

The cortex is also said to have a *sensory* zone, supposed to be localized in the parieto-temporal lobes, and to be differentiated for different sensations, as follows:—tactile sensation, hippocampal region; smell and taste, lower part of temporo-sphenoidal lobe; sight, angular gyrus and supra-marginal lobule; hearing, superior temporo-sphenoidal convolution. From a pathological point of view there is thus far no direct evidence of this localization of sensory centres; but Ferrier holds that this must be looked for in connection with *bilateral* destructive lesions. He is also of opinion that sensory hallucinations in cases of insanity, as well as certain subjective sensations which usher in some epileptic attacks, are due to some morbid irritation of the cortical sensory centres.

No symptoms have as yet been definitely associated with lesions of the occipital lobes.

Coming now to the ganglia within the brain, and their surrounding medullary substance, the *corpus striatum* and anterior two-thirds of the internal capsule are concerned with motion, and a lesion affecting this part of the brain induces hemiplegia on the opposite side of the body, of the ordinary type. If the lesion is sudden, loss of consciousness and impairment of sensation usually occur, of a temporary nature; but these symptoms are the result of its indirect effects. When it involves only the *nucleus caudatus* or the *nucleus lenticularis*, it is believed that the paralysis is merely temporary, and is comparatively slight in the former case. Hughlings Jackson is of opinion that the arm suffers

less, and the leg more, the further back the lesion is situated. Should the anterior two-thirds of the internal capsule be ruptured, hemiplegia is marked and permanent, and it is only under such circumstances that secondary degeneration of the motor tracts, with consequent permanent rigidity, takes place.

The *optic thalamus* and posterior third of the internal capsule are concerned with sensation. The researches of Charcot and others have shown that destructive lesions of the internal capsule, external to the optic thalamus, cause hemi-anæsthesia on the opposite side of the body.

Lesions of the *corpora quadrigemina* are very rarely limited to these bodies, but they are liable to be involved along with neighbouring structures. If one of them is destroyed, vision is lost on the opposite side, this being due to destruction of the anterior tubercle; conversely, if the eye is destroyed on one side, the opposite tubercle becomes atrophied. The motions of the iris are also paralyzed if the lesion extends deeply. Equilibration and co-ordination are likewise disturbed; but these disorders have been attributed to lesions of the subjacent tracts, especially the superficial cerebellar peduncle. Irritation of both corpora quadrigemina on one side gives rise to dilatation of the pupil, and hemi-opisthotonos of the opposite side, which becomes general if the irritation is prolonged or bilateral, the head being retracted and the legs extended, trismus being also very marked. Unilateral destruction is said to cause incurvation of the trunk, and gyration to the side of lesion.

When either *crus cerebri* is destroyed, the consequences are paralysis of motion and sensation on the opposite side, sensation being especially affected, with marked vaso-motor paralysis, and a consequent rise of temperature of 2° or 3° in the paralyzed limbs; if the lower part of the crus is involved, the third nerve is implicated, there being hence oculo-motor paralysis on the same side as the injury.

Before quitting the cerebrum, it may be well to notice the important aid which the ophthalmoscope may afford in localizing diseases in this part of the brain; and Dr. Gowers has also drawn my particular attention to the necessity of testing the field of vision for this purpose. For instance, partial double hemiopia is often present when unsuspected by the patient. This shows disease of the optic fibres on the side opposite to the hemiopia, behind the commissure; or of their terminations in the central ganglia, corpora geniculata, or optic thalamus. Hence, when other nervous symptoms are bilateral, this hemiopia may afford the only indication as to the side which is affected, and it may be the means of still further localizing the mischief to that part of the hemisphere which is contiguous to the optic tract and ganglia. If the lesion is situated in the commissure itself, which is very rare, the loss of vision is not on the same side in both eyes, but the two outer or two inner fields are lost.

It is not easy to determine definitely the symptoms directly due to disease of the *cerebellum*, so many of the phenomena which are observed being indirectly induced. The chief symptoms are due to a peculiar disorder of equilibrium. There is no true motor paralysis, and although opposite hemiplegia is not unusual in cerebellar disease, this is probably

the result of its indirect effects upon the subjacent motor tracts, which decussate at the pyramids. When any attempt at locomotion is made, the patient exhibits a reeling or staggering gait, with a constant tendency to stumble or fall over any obstacle or on moving hurriedly. The movements are not due to any want of co-ordination, but are such as would be made to preserve equilibrium, or to prevent the patient from falling. Sensation is not affected, unless it be indirectly. Nystagmus and strabismus have been noticed, more especially in connection with disease of the cerebellar peduncles. When the middle lobe of the cerebellum is the seat of hæmorrhage, vascular excitement of the sexual organs has been frequently observed, indicated in males by marked priapism, and it has been supposed that the cerebellum or, according to some writers, its middle lobe, is connected with the sexual instinct. This is not the case, however, according to the best authorities of the present day, who regard the sexual excitement as an indirect symptom, due to irritation of the posterior surface of the medulla and pons. Pain in the back of the head is often present in cerebellar disease; and vomiting is a very frequent symptom, probably on account of the indirect effect of the disease upon the medulla. In connection with lesions of the superior and middle cerebellar peduncles, the special phenomena observed are a rotatory distortion of the head and trunk, usually towards the side of the lesion; and a peculiar distortion of the optic axes, the eye on the side of the lesion being directed downwards and inwards, the opposite one upwards and outwards. Much, however, will depend upon the exact seat of the lesion, and whether it is of a destructive or irritative character.

A sudden lesion in connection with the *pons Varolii* and *medulla oblongata* usually proves speedily fatal, owing to the interference with the functions essential to life thus induced, namely, respiration and circulation. In this portion of the nerve-centres not only do the motor and sensory tracts meet and blend, but several nerves have their nuclei of origin here. Hence the phenomena observed are liable to considerable variation and combination, according to the exact localization of the lesion, for not only may the different tracts be involved, but also either of the nerve-nuclei may be implicated, or the nerves after their emergence from these nuclei, whether their function be motor, sensory, or peculiar. Consequently it is in connection with lesions involving this region that so-called *cross-paralysis* occurs, in which the limbs are paralyzed on the side opposite the disease, and the face on the same side. In other cases there may be general paralysis of the limbs; or paralysis of one arm and both legs, or *vice versa*. The muscles of the eyes are variously affected; and one or both facial nerves may be involved, according to the seat of the disease. The fifth and other sensory nerves may also be implicated, and thus various degrees of impairment of sensation induced, usually irregular in distribution. Difficulties connected with mastication, deglutition, phonation, articulation, respiration, circulation, or the power of control over the bladder and rectum are observed in different combinations; and it is to interference with certain of these functions that the great danger arising from diseases implicating the pons Varolii and medulla oblongata is due.

b. With respect to lesions of the *spinal cord*, if this is destroyed in its entire thickness, complete motor and sensory paralysis in the parts below the seat of lesion will ensue. Generally, as has been already stated, this involves only the legs and the lower part of the trunk, but if the mischief is situated at or above the cervical enlargement, the arms will also be paralyzed; while if it is high up in the cervical region, the respiratory muscles and diaphragm become involved, and death will take place from asphyxia. With regard to micturition, a lesion in the cervical or upper dorsal region generally causes difficulty in performing the act, or retention of urine, owing to spasm of the sphincter; if it should occupy the lower dorsal or lumbar region, the sphincter is paralyzed, with consequent involuntary escape of urine. Constipation is usually marked; and defæcation may be involuntary. In some cases the destruction of the cord is not complete, and hence there is only impairment of the motor and sensory functions below the seat of disease. Again, it not uncommonly happens that motor power is entirely lost, while sensation remains. This is due to the fact that the sensory tracts are confined to the posterior cornua and the rest of the grey matter behind the central canal of the cord; therefore, in diseases of its periphery, or of the surrounding membranes, the sensory tracts are so situated that they may escape, while it also appears that a very narrow thread of grey matter is sufficient to keep up the connection.

Coming now to the consideration of lesions involving special tracts in the spinal cord, if one *lateral half* is destroyed in its entire thickness, but to a limited extent longitudinally, this causes complete motor paralysis below the lesion *on the same side*; sensory paralysis *on the opposite side*, the upper limit of which is indicated by a more or less distinct line of demarcation. This precise limitation of a disease to one half of the spinal cord, is, however, very rare, but the lesion may even be limited to a particular tract, and thus affect motion or sensation only. It happens extremely rarely, if ever, that a lesion is limited to the *posterior part of the central region of the cord*, so as to induce bilateral sensory paralysis, motion being unaffected. One form of lesion tends to limit itself to special tracts, and consequently very striking phenomena are produced. If the mischief is confined to the *posterior columns*, or, according to Charcot, to the *outer bands* of these columns, which are contiguous to the inner and posterior aspects of the posterior cornua and the roots of the sensory nerves, there is loss of co-ordinating power over the muscles below the seat of disease, without any actual paralysis, as in locomotor ataxy. If the *lateral columns* are alone involved, more especially the white matter which lies behind a horizontal line drawn laterally through the median canal, motor paralysis occurs in the parts below, the muscles also tending to become at first tremulous, and ultimately more or less rigid and contracted. A lesion may even be limited to the groups of large cells constituting the motor nuclei in the anterior cornua, and then paralysis only affects those muscles supplied by nerves arising from these diseased spots, this being frequently speedily followed by loss of electric contractility and wasting. The relations of other trophic lesions to implication of particular parts of the spinal cord have

been already pointed out. It will be readily understood that in the case of irritative lesions involving the cord, the distribution of the phenomena observed will be the same as in connection with destructive lesions, according to the part implicated, these phenomena only differing in their kind.

CHAPTER LVIII.

HEMICRANIA—MIGRAINE OR MEGRIM— SICK-HEADACHE.

ÆTIOLOGY AND PATHOLOGY.—Most authorities regard the complaint known as *migraine* or *sick-headache* as being quite independent of any morbid state of the alimentary canal, and as essentially a nervous affection. Allbutt, however, considers that derangements of the abdominal viscera have an important influence in giving rise to migraine. The chief views as to the pathology of this malady are as follows:—
1. That it is a form of neuralgia of the ophthalmic or occipital nerve; or of the filaments distributed to the dura mater. Some regard this neuralgia as being merely due to peripheral causes, but Anstie, who was strongly in favour of the theory that migraine is a form of *trigeminal neuralgia*, attributed it primarily to a morbid condition at the root of the fifth nerve in the medulla oblongata, its central nucleus in this part being the seat of atrophic molecular irritation, which has an unusually strong tendency to communicate itself to the neighbouring and closely connected nucleus of the vagus. 2. That the complaint is due to vaso-motor disturbance affecting the vessels of the head, produced through the sympathetic nerve. Latham considers that in the premonitory stage of sick-headache the small arteries are contracted, owing to excitement of the vaso-motor nerves, which depends upon a weakening of the controlling power exercised over them by the cerebro-spinal system, this probably originating in the medulla oblongata. During the stage of headache it is supposed that the nerves become paralyzed, and the vessels are consequently dilated; and Latham is of opinion that this paralysis is the result of depression following the previous excitement. 3. Liveing, in his admirable work on this subject, has advanced the hypothesis that the paroxysms of migraine are due to “nerve-storms, traversing more or less of the sensory tract from the optic thalami to the ganglia of the vagus, or else radiating in the same tract from a focus in the neighbourhood of the quadrigeminal bodies.”

The chief *predisposing causes* of migraine are the female sex, attacks being peculiarly liable to occur about the menstrual periods; hereditary tendency to the complaint, or to various other neuroses; anæmia and general want of tone; and a nervous, excitable temperament. A paroxysm often comes on without any obvious *exciting cause*, but it may follow errors in diet; exposure to the sun; breathing vitiated air; undue mental excitement or effort; fatigue, especially when combined

with fasting; excessive sexual indulgence; and various other causes which lead to physical or mental depression. Sometimes it results from some disturbance affecting the sight or hearing; and it may be brought on by straining the eyes, as after prolonged reading or sewing.

SYMPTOMS.—Sick-headache is characterized by periodic attacks, which usually commence during the period of bodily development, in persons from 15 to 25 years old; as a rule becoming more frequent and severe up to a certain time; but tending to diminish in frequency, or even to cease altogether in advanced age, particularly after the change of life in women.

An attack of migraine is generally ushered in by some *premonitory* symptoms, which are mostly observed when the patient awakens in the morning, such as a sense of depression, heaviness, or general uneasiness; vertigo; disturbed vision, especially a wavy glimmering; chilliness and shuddering; coldness of the hands and feet; tingling in the arm or tongue; irritability of temper; yawning, gaping, or sighing; disorder of speech or hearing; or disinclination for food, with a slimy taste. Soon the pain commences, and speedily becomes intense. Almost always it is unilateral, being felt chiefly in the supra-orbital region or sometimes within the orbit, but not uncommonly extending over the whole side of the head. The precise character of the pain varies much in different cases, but it is generally accompanied with a sensation of throbbing. Pressure on the carotid artery usually diminishes its intensity. There is increased local heat; and in many cases redness of the conjunctiva is observed, with an excessive flow of tears. During a severe paroxysm the patient usually takes to bed, feels extremely depressed and low, dreads every disturbance, begs to be left at rest, and is especially sensitive to light and noise. The pulse is frequently slow and soft. The pupils are contracted. When the suffering reaches its height, nausea and bilious vomiting generally set in, aggravating the pain, but afterwards this gradually diminishes, and the patient usually falls asleep. Anstie remarked that this vomiting is not ordinarily remedial, but that it "merely indicates the lowest point of nervous depression." Vomiting may be directly beneficial, however, if there is much undigested food in the stomach. On awaking from sleep, the patient finds as a rule that the pain has ceased, but frequently complains of a little superficial tenderness for a day or two, and feels out of sorts. The *duration* of an attack is very variable in different cases, but it does not commonly last more than twenty-four hours, though it may go on for two or three days or more.

TREATMENT.—During the *premonitory* stage of an attack of migraine, if this is evident, certain measures may be adopted with the view of preventing or mitigating the subsequent symptoms. The patient should at once retire into a quiet darkened room, and lie down on the side which former experience has shown to be usually the seat of pain, with the head low, the extremities being kept warm. Very many remedies have been recommended for sick-headache, but their usefulness differs in different cases. The most important are *diffusible stimulants*, such as a little brandy or sherry and soda-water, champagne, or spirits of ammonia; a cup of simple strong tea or coffee; hydrate of chloral; croton-chloral; tincture of cannabis indica; bromide of potas-

sium; nitrate of ammonium; caffeine, either internally or by subcutaneous injection; and the guarana powder, which consists of the powdered seeds of the *Paulinia sorbilis*. The drug last-mentioned is given in doses of gr. x-xv, but there is much contradiction in the statements of different observers as to its efficacy, and in my own experience it has had very different effects. The application of a weak continuous galvanic current is sometimes useful. Anstie recommended a warm foot-bath containing mustard, and for the patient to breathe the steam from this at the same time. In some cases I have found the administration of an *emetic*, such as sulphate of zinc, decidedly beneficial. Much relief often results from tightly binding the head with a wet bandage. Probably the steady application of ice, or the cold douche, might be serviceable in some cases. During the height of an attack it is best to leave the patient in perfect quiet, and not to give food or anything else. In the *intervals* many of the measures recommended for the treatment of neuralgia are indicated, and among the most useful medicines may be mentioned strychnine, arsenic, quinine, and bromide of potassium. Tincture of *cannabis indica*, \mathfrak{m} v-x, thrice daily, has been found beneficial by several observers. Tincture of *actæa racemosa* has also been recommended. It is requisite to attend to the state of the alimentary canal; and to avoid all causes which are likely to give rise to an attack of migraine.

CHAPTER LIX.

EPILEPSY—FALLING SICKNESS.

ÆTIOLOGY AND PATHOLOGY.—Epilepsy is the name given to a group of cases characterized by fits of loss of consciousness with convulsive seizures. It cannot be properly regarded as a distinct disease, as the fits may occur under a variety of conditions, including the following:—
 1. In connection with various *organic diseases of the brain or its membranes*, for example, meningitis, hydrocephalus, tumour, embolism, softening, or syphilitic disease. 2. As the result of morbid conditions of the skull, which lead to pressure upon, or irritation of this organ, such as exostosis, a fracture with projecting spicula of bone, or necrosis. 3. From disorders of the *cerebral circulation*, leading to congestion or anæmia. 4. In certain forms of *blood-poisoning*, for example, uræmia and saturnism. 5. As a so-called *functional* affection, to which some writers specially apply the term *epilepsy*. In cases belonging to this group, although organic changes have been described in the brain and meninges, these are commonly absent, and when present they are probably the effects of repeated fits, rather than the cause of the epileptic phenomena. One view as to the nature of this functional variety of epilepsy is that it depends upon some nutritive change in the medulla oblongata, upper part of the cord, and vaso-motor centres, which leads to excessive and perverted action in these parts, inducing sudden con-

traction of the vessels of the brain and cord, as well as of those supplying the muscles of the face, pharynx, larynx, respiratory apparatus, and limbs, to which all the subsequent phenomena of the fit may be traced. According to another theory a sudden discharge of nerve-force takes place from an immense number of nerve-cells at the beginning of a fit, which leads to shock, and the convulsions, like other forms of this disorder, are the result of a "discharging lesion." The remote causes to which epilepsy which is independent of some obvious local cause has been attributed are :—1. *Mental disturbance*, especially emotional, for example, a sudden fright, prolonged grief or anxiety; and also excessive mental work, or undue forcing of the brain in childhood. 2. *Physical influences* affecting the brain, as a blow or fall on the head, or sunstroke. 3. Certain conditions affecting the state of the *blood* and *general system*, and thus influencing the nutrition of the brain, such as syphilis, rheumatism, gout, acute specific diseases, pneumonia, pregnancy. 4. *Reflex irritation*, as from dentition, worms, uterine and ovarian disturbances, sexual excesses or masturbation. Great prominence has been given by some writers to the sexual functions as a cause of epilepsy. 5. *Hereditary taint*. Undoubtedly this has an important influence in the causation of epilepsy, especially when it comes from the mother's side. In a considerable proportion of cases either epilepsy or some allied neurosis is prevalent in the family. Probably intemperance in the parents, syphilis, or a fright to the mother while the child is *in utero*, may be the means of inducing a congenital tendency to epilepsy. The complaint is developed at an earlier age in hereditary cases. 6. *Idiopathic*. This term applies to cases in which no obvious cause can be made out. Age requires special notice as a *predisposing cause* of epilepsy. In the great majority of cases the disease is developed between 10 and 20 years of age, and especially at or about the period of puberty. Sex does not seem to have any particular influence in young persons, but it is said that in persons of somewhat advanced age, the proportion of cases of epilepsy is greater in women. It rarely happens that any immediate *exciting cause* of a fit can be made out.

SYMPTOMS.—Attacks of epilepsy assume one of two forms, of each of which it will be necessary to describe the typical characters.

1. **Epilepsia mitior.**—**Petit mal.**—This form is characterized by sudden and complete loss of consciousness, coming on without any warning, and lasting only for an instant, or at most for a few seconds; accompanied with slight pallor and subsequent dusiness of the face; loss of all expression; dilated pupils; and often, but not always, slight spasmodic movements affecting the face, respiratory muscles, or limbs. If the individual is speaking, he stops in the middle of a sentence, and generally appears to hold his breath. Voluntary movements cease, but automatic actions go on as a rule, such as those which are necessary for standing, sitting, or riding. In some cases there is not absolute unconsciousness, and there may be but a feeling of sudden vertigo—*vertige épileptique*—which causes the patient to cling to the nearest object. After the attack there is some degree of mental confusion, lasting but a few minutes, during which the patient says and does things which he afterwards forgets and denies. Slight squinting may

be noticed, or a feeling of choking may be experienced. On recovery there is no recollection of what has happened. These attacks may be preceded by an *aura epileptica*, and they may be premonitory of severe epileptic seizures, or both forms may occur in the same subject. They are frequently followed by serious mental changes, ending in dementia or mania.

2. *Epilepsia gravior*.—*Haut mal*.—The advent of a fit of epilepsy is in a large proportion of cases indicated by *premonitory* symptoms, varying in duration from an instant to several hours or days. They present great variety, being either subjective or objective, and commonly of a nervous character, affecting the mental condition; general sensation or the special senses; the muscular system; or the vaso-motor nerves. Sometimes they are extrinsic, such as vomiting, obstinate constipation, sallowness of the skin, or foetid secretions. The so-called *aura epileptica* requires a few words of special comment. This is a peculiar sensation, well-known to the patient, which in many cases immediately precedes a fit, generally appearing to start from the distal end of a limb, especially the arm, and to run up towards the head, on reaching which part the seizure takes place. Sometimes it only extends from the elbow to the shoulder, or from the leg to the epigastrium, and has been stated to pass from the testicle or uterus to the throat. The sensation varies in its exact character, but has been compared to a stream of cold or hot air, and is frequently not unpleasant. It is curious that its ascent may sometimes be stopped, and the fit prevented by pressure above where the sensation starts from, which need not be so powerful as to stop the circulation, and sometimes this will happen when the pressure is applied to the opposite arm.

Actual attack.—Three marked stages characterize an epileptic fit:—

Stage I.—The phenomena of this stage are a single, peculiarly disagreeable cry, yell, or moan in many cases, but not in all; immediately followed by absolute and instantaneous loss of consciousness, the patient falling anywhere, or often appearing to be thrown down; a violent tonic spasm of the muscles throughout the body, beginning generally about the face and neck, the whole muscular system being in a state of extreme rigidity and strain, but not equally so, and hence there is a hideous distortion of the features, limbs, and body, the latter being drawn to one side, and the neck twisted so that the face looks over one shoulder, while the teeth are firmly clenched, the eyes wide open, and the eyeballs turned up or in; stoppage of respiration, usually complete, owing to the spasm of the muscles; change in colour of the face almost invariably, in many cases deadly pallor being observed at first, followed by duskiness or lividity, or this may be present from the commencement, or be preceded by florid or dull redness; marked dilatation of the pupils; and feebleness or cessation of the pulse at the wrist, due to the muscular spasm, for the heart acts forcibly, and the carotids throb violently. Practically these phenomena may be considered as simultaneous, the whole stage not lasting longer than from two or three to thirty or forty seconds.

Stage II.—The transition to this stage is abrupt, and is indicated by restoration of breathing, the respiratory muscles becoming relaxed, and the retained air being expelled. Unconsciousness continues, but

severe clonic spasms take the place of the tonic rigidity, usually beginning with twitchings about the face or sometimes in the limbs, but soon extending more or less over the whole body, though often more violent on one side than the other. From these spasms originate the phenomena of this stage, viz., hideous distortion and convulsive movements of the features and eyeballs; forcible closure and champing of the jaws, causing grating of the teeth, foaming at the mouth, partly due to formation of excess of secretion, which is blown out of the mouth, and biting of the tongue or cheek, the froth being therefore often bloody; violent convulsive movements of the body and limbs, which are thrown about and twisted in all directions, the fingers being generally bent and the thumb pressed into the palm; alternate dilatation and contraction of the pupils; laboured, panting, and irregularly convulsive respiratory movements, often attended with gurgling sounds due to mucus in the trachea; increasing duskiness or lividity and turgidity of the face, tongue, and body generally, with distension of the veins, some of the smaller vessels sometimes giving way, thus giving rise to extensive petechiæ about the face or head; profuse perspirations, the sweat being sometimes peculiarly foetid; tumultuous action of the heart, with throbbing of the large arteries, though the radial pulse is often weak; involuntary discharge of urine, fæces, or semen; and frequently rumbling noises in the intestines, vomiting, or hiccup. The average duration is said to be from $4\frac{1}{2}$ to $5\frac{1}{2}$ minutes, but it may vary from a few seconds to 10 minutes. The clonic spasms are believed to be the result of the stoppage of respiration in the previous stage, with consequent asphyxia.

Stage III.—There is a gradual return to consciousness, with cessation of the spasmodic movements. The patient looks around with a bewildered, alarmed, or sad expression, and often attempts to get up or to speak, but some few minutes usually elapse before consciousness is completely restored. The heart still acts vigorously, and the skin is bathed in sweat. Vomiting often takes place. A large quantity of pale and watery urine may be passed, containing excess of urea and urates, or sometimes abundant phosphates; and it is said that a trace of sugar has been found after a severe epileptic fit. After return to consciousness the patient feels usually very exhausted and sleepy, as well as mentally confused, and complains of headache. In many cases, but by no means in all, he falls into a state of heavy sleep or stupor, almost amounting to coma, attended with a stertorous noise in breathing, from which it is difficult or impossible to rouse him, and which lasts for a variable time, sometimes passing into natural sleep. The muscles are relaxed, but present occasional twitchings or slight spasmodic movements. The face generally remains more or less dusky for some time, and the petechiæ continue visible. The patient is often languid and out of sorts for some days after a fit.

The *frequency* and *severity* of the fits vary much in different cases. In a good many a tolerably marked periodicity is observed. In few instances does the interval extend beyond a month. The seizures are more frequent as a rule in severe cases, and they tend to increase in frequency and intensity as the disease advances. Not uncommonly two or more fits occur in succession, followed by a period of free-

dom from attacks. They are liable to come on by night as well as by day ; and nocturnal fits of epilepsy may occur without the patient being in the least aware that they have taken place.

The *general* state of the patient also differs considerably. There is rarely perfect health, especially after epilepsy has existed for some time. Many epileptic patients suffer from headache or giddiness and various other symptoms, the general system and digestive organs being also out of condition. The *mental* faculties become more or less weakened in most cases, and this may end in complete dementia or dangerous epileptic insanity. Sometimes partial and limited paralysis, twitchings, curious movements, disorders affecting sensation or the special senses, and other nervous phenomena are observed. As *complications* of epileptic fits, coma resulting from injury to the head, apoplexy, or meningitis may arise.

DIAGNOSIS.—The chief conditions from which idiopathic epilepsy may have to be distinguished are hysteria ; reflex convulsions ; epileptiform attacks due to cerebral organic diseases, uræmia, or chronic alcoholism ; syncope ; and feigned epilepsy. Some of these will be alluded to in future chapters. With regard to hysteria, a condition named hysterio-epilepsy is now recognized, which presents a combination of the phenomena of both diseases. Attacks of *petit mal* have to be distinguished from fits of syncope ; and from vertiginous attacks in cases of Menière's disease.

PROGNOSIS.—A cautious opinion should always be given in cases of epilepsy as to the final issue. Very rarely does a fit end fatally, but this might happen in consequence of some complication. As to the curability or improvement of the disease, the favourable prognostic circumstances are its being recent, or due to some definite cause which can be removed ; the patient being very young and a male ; absence of hereditary taint ; the mind being unaffected ; and the fits being of frequent occurrence. Inherited epilepsy is very rarely cured ; and if the attacks have begun in early childhood from some reflex irritation, and have lasted many years, the prognosis is also very unfavourable. The mental faculties are more liable to become affected in females ; in persons who are strong and healthy ; when the disease begins late in life ; when the fits occur in rapid succession, with attacks of "petit mal ;" and, it is said, when the spasms are not marked during the fit, and there is little or no subsequent coma.

TREATMENT.—1. **During a fit.**—It is best not to interfere actively during an epileptic seizure in most cases, merely attending to the matters mentioned when speaking of convulsions in general, preventing injury, but not holding the patient forcibly, and putting something between the teeth. If the fit does not soon cease, water may be dashed over the face and chest, and should it become dangerously prolonged, such measures might be had recourse to as the application of sinapisms to various parts ; a warm bath, with cold affusion while the patient is in it ; ice to the spine or head ; stimulant enemata ; electricity ; local removal of blood from about the head ; or even venesection should there be great danger of asphyxia. After a fit the patient should be placed in a comfortable position, kept quiet, and allowed to sleep.

2. **In the intervals.**—There are certain well-defined principles to

be followed in the management of an epileptic patient. *a.* It is requisite to look for and remove any obvious *cause* of epilepsy. Thus, should there be any local cause of irritation, such as a foreign body irritating a nerve, or worms, this must be got rid of. Further, as epilepsy may depend on some central organic mischief, careful investigation is required in order, if possible, to find out and treat any such disease, especially if due to syphilis, when iodide of potassium is of the greatest service. Any constitutional condition, as rickets or tuberculosis, must be attended to. *b.* The *general management* of an epileptic patient is highly important. He should have a nutritious, but light and digestible diet; take moderate daily exercise in the open air; be surrounded by proper hygienic conditions; avoid much mental work, especially in the case of children, who should be kept from school, though if the general health is good, older patients may follow some light occupation; have cold or tepid sponging daily, with friction afterwards; check any vicious habit, such as excessive venery, masturbation, or intemperance; and take a sufficient amount of sleep, the head being well-raised in bed. It is necessary to regulate the digestive functions, especially avoiding constipation, but only mild aperients should be used. Iron if there is anæmia, quinine, strychnine, arsenic, and other nervine or general *tonics* are often of service. Cod-liver oil is also frequently of much value. Many epileptics require constant watching, and all need more or less supervision; above all they must not be allowed to go into positions where they would be in danger from falling, or near a fire or water. Epileptic patients decidedly ought not to marry.

3. **Specific treatment.**—Innumerable specifics have been brought forward for the cure of epilepsy. Of these the only drugs that deserve special mention are bromides, especially bromide of potassium and ammonium; belladonna or atropine; stramonium; conium; extract or tincture of cannabis indica; preparations of zinc, especially the oxide, the sulphate in gradually increasing doses up to 10, 15, 20, or more grains thrice daily, the valerianate, the acetate, and the bromide; ammonio-sulphate of copper; nitrate of silver in minute doses; opium in small quantities; and chloroform, by inhalation, not in sufficient quantity to induce complete insensibility, either systematically employed at certain intervals daily, or only administered when there are signs of an impending fit. Nitrite of amyl has been recently recommended. Doubtless all these agents prove serviceable in different cases, and sometimes they may be usefully combined, as, for example, belladonna with sulphate of zinc. Bromide of potassium has been found eminently beneficial when given in doses of gr. v-xxx or more thrice daily, on an empty stomach. It almost always lessens the number of fits; often keeps them off entirely, though the dose has generally to be gradually increased in order to accomplish this end; and sometimes a complete cure is effected by its use. The bromide is found to be particularly useful when the attacks are chiefly or entirely of the "haut mal" type; when they are very frequent; and when they occur mainly by day. Brown-Séquard recommends a combination of bromide of potassium and ammonium. Dr. Chapman treats epilepsy by the constant application of ice to the spine, and in some instances this seems to be useful. In obstinate and dangerous cases local removal of blood from the back

of the neck, followed by counter-irritation by means of blisters, the actual cautery, setons, or issues, either over this region or between the scapulæ, has been recommended. In very severe cases it has also been advocated to shave the head and apply croton oil liniment. When there is an aura starting from limb, finger, or toe, a circular blister applied around the part may prove highly useful. The treatment of epilepsy by clitoridectomy, castration, circumcision, and such methods needs only be mentioned to be condemned. Trephining the skull has been resorted to in some dangerous cases with advantage.

4. **Prevention of fits.**—Some authorities attach considerable importance to the *prevention* of the fits in the curative treatment of epilepsy, by attending to warnings, and thus endeavouring to make the attacks abortive, and to prevent the changes in the nerve-centres which increase the tendency to other attacks. The measures to be adopted depend upon the nature of the premonitory symptoms. Thus, if a sensory aura is felt in a limb, a handkerchief or band should be applied tightly around this part rapidly, and several times in succession. A case was under my notice for a considerable time, in which the aura started from the thumb, and the patient used to prevent fits after a severe struggle by drawing a handkerchief tightly round the wrist. Brown-Séquard has shown that the fits may be averted by applying the ligature round another limb; as well as by pinching or striking the skin, or irritating its nerves by heat, cold, galvanism, or repeated pricks with a needle. If an involuntary muscular contraction precedes loss of consciousness, it is recommended to draw forcibly on the contracted limbs, so as to elongate them; or a blow, pressure, or friction upon parts where some muscles become rigid may have an equally good effect. In cases where disorders of breathing or laryngismus occur at the outset, the use of ether or chloroform as an anæsthetic is recommended. In connection with laryngismus, Brown-Séquard has found cauterization of the fauces with a strong solution of nitrate of silver very efficacious. Among other preventive measures available in different cases this authority mentions the administration of an emetic, purgative, or stimulant; a full dose of chloral hydrate; subcutaneous injection of atropine or morphia; the immersion of the hands in hot water; inhalation of nitrite of amyl; rapid and ample respiratory movements for five or six minutes; jumping or running; and reading very fast.

CHAPTER LX.

HYSTERIA AND ALLIED AFFECTIONS.

PATHOLOGY AND ÆTIOLOGY.—Hysteria is a very complex morbid condition, of the nature of which it is impossible to speak definitely. It belongs to the nervous disorders, but its exact seat cannot be localized, though probably the brain is most disturbed. No characteristic pathological change has been discovered, but there is probably some nutritive derangement of the entire nervous system. The attempt to

localize the primary disorder in the sympathetic ganglia, and to attribute the phenomena observed to vaso-motor disturbance, has no sufficient foundation.

Hysteria is infinitely more common among females, beginning usually from 15 to 18 or 20 years of age, but sometimes at a much earlier or later period, in exceptional cases only developing at the change of life. Young girls, old maids, widows, and childless married women are the most frequent subjects of the complaint, and its manifestations often cease after marriage. Hysterical fits are more common about the menstrual periods. These facts have led many to consider the hysterical condition as being primarily connected with some disturbance of the sexual organs or functions, which affects the nervous system. It has thus been attributed to malpositions of the uterus; undue sexual excitement and unsatisfied desire; venereal excess; and disordered menstruation, in the way of menorrhagia, amenorrhœa, or dysmenorrhœa. Charcot attributes great importance to ovarian hyperæsthesia as a cause of hysteria. That uterine and ovarian disturbances do help greatly in exciting hysterical attacks in a large number of instances cannot be doubted, but many eminent authorities deny that these constitute the essence of the complaint. Its frequency in women is probably due to the inherent conditions of their nervous system, often aggravated by their mode of existence. The general system may be disordered by many conditions, but the sexual functions assume an undue prominence in the mind, and thus any disturbance in connection with these functions produces an exaggerated effect. In many cases of hysteria there is nothing wrong about the generative organs or functions; while it occurs often enough in married women with families. The improvement which frequently takes place after marriage may be accounted for by the change in habits, thoughts, purposes, occupation, and general surroundings which this event usually involves.

Hysteria is in some instances distinctly traceable to digestive disturbances, especially long-continued constipation with accumulation of feces. Causes referable to the mode in which girls are brought up, and to their general habits of life, aid materially in its production, such as want of useful occupation; indolent and luxurious habits; over-petting and spoiling; subjection to the petty worries of fashionable life; keeping late hours at parties; or reading sentimental novels. Temperament and hereditary predisposition to nervous affections may have some influence, but the latter may often be explained by the patient imitating a hysterical mother. In not a few cases hysteria results from depressing influences, such as long-continued anxiety or grief; disappointed affection; or over-work, with bad feeding and improper hygienic conditions. It may further depend upon some definite chronic disease, either local or general. In some instances the condition named hysterical can only be attributed to wickedness and perversity.

The hysterical state is now and then observed in males, but infinitely rarely an actual fit of hysteria. The subjects of this condition are usually from 35 to 50 years of age, and its causes are excessive venery or masturbation; over-work, with long-continued worry and anxiety; excessive and prolonged mental labour; senile degeneration; or commencing chronic cerebral disease.

The *exciting cause* of the first hysterical fit is generally some powerful and sudden emotional disturbance, such as a fright, but this may be very slight, if the patient has previously been in a state of mental restraint, with pent-up feelings; or has been subject to depressing influences for a considerable period. Subsequent paroxysms also are liable to arise from a much slighter disturbance than that which brought on the first attack. Suppressed laughter may lead to very severe fits of hysteria. Occasionally they result from physical disturbance, such as injury; loss of blood; or some acute illness.

SYMPTOMS.—It is impossible to give even an outline of the varieties of clinical phenomena which may be presented in cases of so-called hysteria. There is scarcely a complaint which may not be simulated. In most cases, however, the prominent features are an undue excitability of the emotions, with defect in the power of the will and intellect; alterations in the general cutaneous sensibility, and in the special senses, usually in the directions of hyperæsthesia and dysæsthesia; and a tendency to involuntary muscular movements, or to some other disturbance of the motor functions. It will be necessary to describe first the characters of certain paroxysms or *hysterical fits*; and then to point out some of the principal phenomena which may be noticed in the *hysterical state*.

The hysterical fit.—As a rule a fit of hysteria occurs when other persons are present, and never comes on during sleep. The attack is not sudden, but gradually worked up to, the patient generally having time to place herself in a comfortable position, and to adjust her dress; it is often preceded by sighing, sobbing, laughing, moaning, nonsensical talking, gesticulation, or a feeling of *globus hystericus*, but not by any peculiar cry. During the actual fit there may be apparent unconsciousness, but this is not complete, as can be determined by touching the conjunctiva; while the patient is generally aware of what is going on around, and looks out from under her eyelids occasionally. Spasmodic movements are observed, varying from slight twitchings in the limbs to powerful general convulsive movements, or almost tetanic spasms. Patients often struggle violently and throw themselves about, while the thumbs are frequently turned in, and the hands clenched. During these movements, which may last only a few moments, or for an indefinite time with or without intermissions, there is no lividity of the face or other sign of interference with respiration. Breathing is noisy and irregular, while gurgling and spluttering sounds are frequently produced in the throat and mouth. The pupils are not dilated; in many cases slight internal strabismus is observed, and the eyes are turned up from time to time. The pulse is normal. There is no biting of the tongue, and rarely any foaming at the mouth. The paroxysm generally terminates with crying, laughing, sighing, or yawning, and is followed by a feeling of exhaustion, but not usually by coma, though in rare instances the patient falls into a kind of prolonged trance. Frequently abundant eructations of gas take place, and there is often a copious discharge of pale watery urine. Rarely an attack is followed by a state of hysterical mania, in which the patient is not responsible for her actions.

The hysterical state.—The chief deviations which so-called

hysterical patients may present may be considered as they affect the mental, sensory, and motor functions respectively.

a. Mental. There is defect of will and of mental power, while the emotional functions are not under proper control, being very readily excited; and tending to lead to exaggerated actions. Some patients say they cannot perform various acts, such as standing, walking, or speaking, which they do perfectly well when they forget themselves. Frequently the spirits fluctuate very rapidly and without cause, from morbid cheerfulness to despondency, and the hysterical patient sobs, sighs, cries, or laughs without adequate reason. Ideation and thought may be over-active in some respects, but the general intellectual vigour is much impaired. Many hysterical patients talk a great deal of nonsense. They have an exaggerated feeling of self-importance; seek attention from others; and are as a rule never so pleased as when they become objects of attraction or sympathy, or are creating a sensation; which accounts for "fasting-girls," trances, some cases of supposed somnambulism, and allied conditions. Many are very restless, irritable, and impatient. Others, however, seem simply indifferent to all around, and remain melancholy, silent, motionless, and apathetic for long periods together, caring nothing about dress or anything else. In some cases a form of mania sets in. Hysterical patients are strongly disposed to take to drinking to excess.

b. Sensory. Commonly a condition of general exaggerated sensibility, hyperæsthesia, or nervousness exists, both as regards cutaneous sensation and the special senses, an unusually slight stimulus being recognized or producing an undue effect. Further, there is often a condition of dysæsthesia, or of painful sensation from slight irritation. This is evidenced chiefly by cutaneous tenderness in certain parts, sometimes intense, especially in the left side; along some portion or the whole of the spinal column, slight pressure over which will often cause severe pains to shoot to distant parts; around the joints; and over the abdomen. The tenderness is greatly diminished by taking off the patient's attention, and it is very superficial, signs of suffering being elicited by a slight touch or a pinch of the skin, but not when steady and firm pressure is made, or when a joint is rudely joggled. Dysæsthesia from slight stimuli may also be evinced in connection with the special senses. Spontaneous pains are commonly complained of in various parts, of a more or less neuralgic character, frequently described as very intense, and being especially seated at the top or back of the head, here often assuming the characters of *clavus hystericus*; in the left side; along the back; over the sacrum or coccyx; and in the joints. Paræsthesiæ, such as formication, numbness, tingling, flashes of light, tinnitus aurium, or a peculiar smell or taste, are also common. A curious sensation often complained of is that named *globus hystericus*, which is a feeling of constriction or of a "ball in the throat," either fixed there and giving rise to the sensation of choking, the patient making all kinds of ineffectual efforts to get rid of it, or ascending upwards from the epigastrium, or even from below this region. In exceptional cases hypæsthesia or even complete anæsthesia of the skin and deeper structures, or of the special senses, is observed. Anæsthesia is generally limited in extent, and irregular in distribution, but there may

be hemi-anæsthesia, or the loss of sensation is confined to the lower limbs, or may be generally distributed. Hysterical hemi-anæsthesia may be complete or incomplete. There is often analgesia, with or without insensibility to heat and cold. Its characteristic features, when the hemi-anæsthesia is complete, have been described by Charcot and others as follows:—There is a distinct line of demarcation separating the anæsthetic from the healthy part, often corresponding closely to the median line; the affected side is comparatively cold and pale; there is a more or less permanent ischæmia, and in intense cases there may be a difficulty in inducing bleeding by pricking the anæsthetic part with a pin; the mucous membranes are involved as well as the skin; the organs of the special senses are affected to some extent on the anæsthetic side, and in connection with vision the phenomenon called *achromatopsia* may be observed in some cases; the viscera do not seem to be implicated, but, on the contrary, ovarian hyperæsthesia is observed on the anæsthetic side. If paresis or contracture supervenes, it shows itself on the affected side. The hemi-anæsthesia is mostly permanent, but presents variations in degree, and in the intensity of its phenomena, some of which are also liable to fluctuate. Patients may be quite unaware of the existence of this symptom. Charcot attaches great importance to ovarian hyperæsthesia or *ovarialgia* in cases of hysteria, to which he attributes the following characters:—It is indicated by pain in the lower part of the abdomen, usually felt on one side, especially the left, but sometimes on both, and occupying the extreme limits of the hypogastric region. It may be extremely acute, the patient not tolerating the slightest touch; but in other cases pressure is necessary to bring it out. The ovary may be felt to be tumefied and enlarged. When the condition is unilateral, it may be accompanied with hemi-anæsthesia, paresis, or contracture, on the same side as the ovarialgia; if it is bilateral, these phenomena also become bilateral. Pressure upon the ovary brings out certain sensations which constitute the *aura hysterica*, but firm and systematic compression has frequently a decisive effect upon the hysterical convulsive attack, the intensity of which it can diminish, and even the cessation of which it may sometimes determine, though it has no effect upon the permanent symptoms of hysteria (Charcot). The bladder or rectum may be affected as regards their sensation in cases of hysteria, leading to great accumulation of urine or fæces, of which the patient is not aware.

c. Motor. Voluntary movements are generally defective, and the power of the will over the muscles is weakened; while all kinds of involuntary movements are exaggerated and very readily excited, namely those due to emotions, ideas, sensations, reflex irritation, and organic causes. The hysterical patient starts suddenly from any slight disturbance, rushes about under the influence of some notion or other, and does various other silly acts. Spasmodic movements or fixed rigidity of different muscles are not uncommonly observed, independent of fits of hysteria, while cramps are very common, as well as spasms of internal organs. Occasionally some form of motor paralysis is noticed; generally it follows a hysterical paroxysm, and is limited to one limb, or more often to a part of it, but may be more or less hemiplegic, paralytic, or even general in its distribution. As a rule sensation is not

impaired in the paralyzed part; the paralysis is incomplete; nutrition is not at all impaired, or only slightly after long duration of the paralysis; while electric irritability is usually unaffected, though electric sensibility may be lessened, and now and then both are diminished or lost. Sometimes rigid flexion of one or more joints is observed, difficult to overcome, which is evidently partly due to voluntary opposition by the patient, and when it is overcome the limb rapidly assumes its former position, sometimes flying back with a sudden spring or jerk. Hysterical paralysis is liable to rapid changes, and may cease suddenly. Under chloroform it completely disappears, and power is restored. The important diagnostic marks of hysterical hemiplegia are that it is usually incomplete; that the tongue and face are rarely involved, though there may be ptosis; that the manner of walking is different from that characteristic of true hemiplegia, there being merely a dragging of the leg without any swinging movement, while the toes are raised; and that when the patient is made to bend forward, the arm is held back. In paraplegia also the paralysis is rarely complete, and one leg is more affected than the other, generally the left; movement of the limbs can often be readily performed in the recumbent posture, but when an attempt is made to walk, the patient being well-supported on either side, all power and control over the muscles seems to be gone, and she falls if the support is removed, but generally manages to recover herself suddenly when near the ground. The bladder and rectum are usually unaffected. Aphonia is a frequent symptom in hysterical patients, resulting from laryngeal paralysis. Here there is no alteration in the quality of the voice as a rule, but it becomes a mere whisper, and if the patient is asked to make an effort to speak, even the power of whispering may be lost. This aphonia often comes on and disappears with remarkable suddenness, especially under the influence of a strong emotion. Some hysterical patients refuse even to attempt to speak. A curious enlargement of the abdomen is observed sometimes, constituting the so-called *phantom tumour*. This region presents a symmetrical prominence in front, often of large size, with a constriction below the margin of the thorax and above the pubes. The enlargement is quite smooth and uniform; soft; very mobile as a whole from side to side; somewhat resonant but variable on percussion; and not painful. Vaginal examination gives negative results; and under chloroform the prominence immediately subsides, returning again as the patient regains consciousness.

Most hysterical patients are out of health, many of them being weak and anæmic. It is a remarkable fact, however, that even when they eat but a very small amount, nutrition often does not seem to fail. Among the numerous symptoms complained of in different cases may be mentioned:—*a. Digestive disturbances*, especially flatulence; borborygmi; copious eructations; cardialgia; depraved appetite; fulness after food; obstinate constipation; intestinal colic or gastralgia. *b. Circulatory disorders*, many of them due to vaso-motor disturbance, such as palpitation; tendency to syncope; epigastric pulsation; throbbing of vessels; coldness of the extremities; sudden flushing and heat of the face. *c. Respiratory symptoms*, for example, a sense of oppression across the chest; fits of hurried and laboured breathing, some-

times assuming a very serious aspect ; spasmodic, irritable, dry cough, of long duration, and having a peculiar squeaking, barking, or howling quality ; hiccup ; and spitting of blood. *d. Menstrual disorders.* *e. Disorders of micturition.* There may be great irritability of the bladder, with frequent micturition ; or in other cases dysuria is present, the urine being retained. Oliguria or even total suppression of urine may be a transient phenomenon in hysterical cases ; and Charcot believes that hysterical ischuria may occur as a permanent symptom, in connection with which repeated vomitings take place, the ejected matters occasionally, it is said, presenting the appearance and exhaling the odour of urine, and yielding on chemical analysis a certain quantity of urea. This condition is not accompanied with any of the signs of uræmia. Many authorities doubt the reality of its occurrence, and in most cases it is unquestionably merely a pretended symptom.

The exact grouping of the phenomena above described is extremely variable in different cases, and also in the same case from time to time. The hysterical state may be permanent ; or it only breaks out at intervals, with greater or less intensity. It is in connection with hysteria that the peculiar phenomena supposed to arise from applying different metals to the surface of the body have been noticed.

Hystero-epilepsy.—A few observations may be made here with reference to the condition which has been termed *hystero-epilepsy* or *epileptiform hysteria*. In this condition paroxysms occur, characterized by great intensity of the convulsive phenomena, combined with certain more or less marked features which recal the phenomena of epilepsy. The cases thus denominated present various characters. In one group, which is the most frequent, the hysterical seizures and epileptic fits remain distinct—*hystero-epilepsy with distinct crises*, and as subdivisions of this group Charcot gives the following :—*a.* Epilepsy is the primary disease, upon which hysteria becomes grafted, most frequently at the period of puberty. *b.* Epilepsy is superadded to hysteria. This variety is much rarer. *c.* Combinations of a secondary order—(i.) Convulsive hysteria coexists along with *petit mal*. (ii.) Convulsive epilepsy is superadded to some of the phenomena of non-convulsive hysteria, *e.g.*, contracture, anæsthesia, &c. In another group the attacks are of a mixed character—*hystero-epilepsy with combined crises*. This class of cases is thus described by Charcot :—*a.* The mixed attack is from the outset epileptiform hysteria. *b.* The hysterical aura always constitutes a prominent symptom. It occupies the abdomen, being generally of long duration, and does not affect the head from the first, or one of the extremities, as takes place in epilepsy with aura. *c.* In the convulsive attack there is at first an *epileptic phase*—a sudden shriek, extreme pallor, loss of consciousness, a fall, distortion of the features—then tonic rigidity seizes on all the members. This rigidity is rarely followed by the clonic convulsions, brief in duration, limited in oscillation, predominating on one side of the body. The face may become greatly tumefied and violet-coloured. There is foaming at the mouth, and the foam is sometimes bloody. Finally, general relaxation of the muscles may follow, with coma, and stertorous respiration during a less or greater length of time. *d.* To this first phase the *clonic phase* succeeds. Then all is hysteria ; great gesticulations, having a purposive character, super-

vene, and sometimes violent contortions are made, characteristic of the most various passions, such as terror, hatred, &c. At the same time paroxysmal delirium breaks out. 2. The termination of the attack is marked by sobs, tears, laughter, &c. These different phases do not always succeed each other in so regular a manner; they get entangled occasionally, and now one, now the other predominates.

As to the nature of these hystero-epileptic seizures, some authorities regard them as a mixture or combination of the two complaints—a hybrid composed half of hysteria and half of epilepsy. According to another view, hysteria is the sole and original disease, and the convulsion, epileptic in form, only appears as an accessory element. This is the view which Charcot supports, on the following grounds:—The epileptic type is never represented in the seizure-fits, save in an imperfect manner; there is never any history of *petit mal* or of epileptic vertigo; and even when the attacks are frequently repeated, obnubilation of the intellect and dementia are never the consequences. Again, in rapidly succeeding fits of true epilepsy the temperature rises quickly to a high degree, accompanied with serious symptoms, and often followed by a fatal termination; whereas in hystero-epilepsy the temperature rarely exceeds the normal standard, and the general state of the patient is not of a kind to inspire uneasiness, even if the fits are very numerous, and continue for several days.

It will be convenient in this connection also just to allude to certain curious nervous phenomena occasionally observed. 1. **Catalepsy.**—In this condition the will seems to be cut off from certain muscles, and whatever position the affected part is placed in, for instance, a limb, it will remain fixed thus for an indefinite time. Catalepsy may or may not be accompanied with unconsciousness. Sensation is usually much impaired, and may be lost. This condition is sometimes associated with organic disease of the brain; or with serious organic visceral disease. 2. **Trance.**—Here the individual lies as if dead, being ghastly pale, circulation and respiration having almost ceased. Persons in a trance have even been “laid out” as dead. 3. **Ecstasy.**—The patient pretends to see visions. Often this is combined with ridiculous dancing movements, such as are practised by certain religious communities.

DIAGNOSIS.—Attention to the characters described as pertaining to a hysterical paroxysm, and the circumstances under which it arises, will usually enable it to be distinguished from epileptic and all other kinds of fits. In women hysteria should always be borne in mind as explaining many of the ailments of which they complain. Among the most important affections which it may simulate are diseases of the brain and spinal cord; disease of the spinal column; peritonitis; abdominal tumours; laryngitis; and diseases of joints. The general signs of hysteria; the absence of pyrexia or of the characteristic symptoms belonging to the several affections; the peculiar superficial nature of any pain or tenderness present; the characters of the different kinds of paralysis, as already described; and the effects of the administration of chloroform, will in most cases enable a satisfactory conclusion to be arrived at.

TREATMENT.—1. **Of a hysterical fit.**—But little interference is needed as a rule. An important matter is, to get rid of the numerous

officials and sympathizing individuals who generally surround the patient. She should be treated firmly but kindly, an endeavour being made to gain her confidence, first ascertaining, if possible, the cause of the fit. Care must be taken to prevent injury, and the clothes should be loosened about the neck and chest. If anything further is demanded, affusion of cold water over the face; the application of ammonia to the nostrils; or the plan of closing firmly the nostrils and mouth for an instant, so that the patient cannot breathe, may be resorted to. In obstinate cases a moderate galvanic shock does no harm. If any medicine is needed, spirits of ammonia with valerian or assafoetida may be given. Charcot has revived the treatment formerly adopted, of making firm pressure over the ovarian region to check hysterical fits, especially if they are of a severe type.

2. **Of the hysterical state.**—The management of persistent and confirmed hysteria is often very difficult. Mental and moral guidance is most important, and the patient should be taught to look away from herself and her grievances, and to engage in some useful occupation. Any injurious habit must be rectified. Change of scene and associations, especially with travelling, is often very serviceable. Any cause of discomfort at home or elsewhere should be removed, if possible. General treatment, directed to the state of the system and of the blood, is often most beneficial; attention being also paid to diet, and to the state of the digestive organs. On no account should hysterical patients be encouraged to take alcoholic stimulants. Various symptoms often call for interference. Pains in different parts are best relieved by belladonna or opium plasters or liniments; that about the joints by warm poultices or fomentations sprinkled with laudanum. Hypodermic injection of morphia may be required. For restlessness and sleeplessness bromide of potassium is the best remedy. Paralysis must be treated by electricity; and rigidity counteracted by fixing the limbs in other positions by means of splints or other mechanical apparatus, and by passive movements. If necessary, chloroform may be used; this agent may also be employed to get rid of a "phantom tumour." I have often found aphonia to be cured by applying a small blister across the larynx, or even a strip of belladonna plaster, these probably acting by exerting a mental influence. In obstinate cases the vocal cords may be galvanized; or the patient may be charged with franklinic electricity, and sparks then taken from over the larynx. It is questionable how far such drugs as assafoetida and valerian are useful in hysteria, when used as a means of cure, except in being very disagreeable; they are valuable, however, as *antispasmodics*.

CHAPTER LXI.

HYPOCHONDRIASIS.

ÆTIOLOGY.—The affection thus named is in reality merely a mental condition, characterized by inordinate attention on the part of the patient to his own real or supposed bodily ailments and sensations. Adult males of the better class, who have no occupation, are the usual subjects of the complaint, but it is not uncommon to meet with it in lesser degrees among working men in out-patient hospital practice.

SYMPTOMS.—As a rule some actual disease sets up the hypochondriacal state originally, especially digestive or biliary disorders ; venereal disease ; or some acute illness. In other instances the symptoms are from the first quite imaginary. The precise symptoms complained of vary much, and they are liable to change from time to time, or new phenomena are added, for which the hypochondriac is ever on the look-out. These patients generally present a healthy appearance, while they sleep and perform their ordinary functions satisfactorily. In typical cases they go the round of the “doctors,” if they can afford it ; take any amount of physic, which they want to be always changing, being particularly anxious to try any new remedy that becomes fashionable ; are delighted to talk about their ailments, often making use of scientific terms ; consult every medical work they can get hold of ; like to be examined again and again ; and are often themselves much addicted to examining their pulse, tongue, urine, and stools. They are very particular about their food and drink ; and often as to their dress and general “get-up.” Hydropathic and similar establishments, as well as districts famed for mineral waters, are favourite places of resort for hypochondriacs. Their moral character, and their feelings towards friends remain unaltered. These cases are always very difficult to improve, being frequently quite incurable. Ultimately they may become wretched misanthropes, and exclude themselves from all society. In the less pronounced cases hypochondriacs merely fix their attention on one or more symptoms, and cannot be persuaded that these are not due to some serious disease. The condition named *agoraphobia* may be regarded as a form of hypochondriasis, in which the patient dreads being out in the streets alone, and cannot go into the midst of any public gathering.

TREATMENT.—The main point in treating hypochondriacs is for the practitioner to try to acquire some control over them, and to make them believe in him, by investigating their case properly, and showing that he takes an interest in and thoroughly understands it. They cannot be talked out of their ailments, but kind and judicious reasoning may often do much, and they should be urged to take off their attention from their symptoms, to mingle in society, travel, or otherwise occupy themselves. Attention must be paid to bathing, exercise, and other modes of promoting the general health. The diet and state of the

digestive organs should also be regulated. As to medicines, something has generally to be administered to hypochondriacs, and the best plan is just to treat the prominent symptoms, taking care not to give anything that can do harm. It is often very useful to send such subjects to hydropathic institutions or mineral spas, chiefly on account of the change they experience, and the society they meet.

CHAPTER LXII.

CHOREA—ST. VITUS'S DANCE.

ÆTIOLOGY AND PATHOLOGY.—Many views have been advanced as to the nature of the complaint named chorea, but it will not serve any practical purpose to allude to them all in this work.

No morbid appearances have yet been acknowledged as characteristic of chorea. In a valuable communication read before the Medico-Chirurgical Society by Dr. Dickinson, the morbid appearances observed in several fatal cases were described as widely-spread symmetrical hyperæmia and its consequences, affecting the nervous centres, but especially the ganglia at the base of the brain and the spinal cord, particularly the upper part of the latter, and the posterior and lateral portions of its grey matter. The hyperæmia was most marked in the arteries, and its effects became apparent according to the duration of the disease, viz., hæmorrhages, peri-arterial exudations and degenerations, and spots of sclerosis in chronic cases. To this increased vascularity and its consequences Dr. Dickinson would attribute the phenomena of chorea, localizing the disturbance chiefly in the spinal cord. He considers it as mainly produced by causes belonging to two classes, viz., the rheumatic condition; and various kinds of irritation, mental and reflex, in connection with the nervous system. He regards the lesions as points of irritation, calculated to excite nervous functions unduly, and thus to lead to muscular excitement.

A theory which was first started by Kirkes, and which is supported by Hughlings Jackson, Broadbent, and others, attributes chorea to minute emboli, which are conveyed from deposits on the valves of the heart, and become lodged in the small vessels of the convolutions near the corpora striata and optic thalami; or in these centres themselves, and other neighbouring parts of the brain. Broadbent localizes the mischief in the corpora striata; Jackson in the adjoining convolutions. Bastian regards the plugs as being of the nature of thrombi, which are formed of accumulations of white corpuscles. As a consequence impaired nutrition of the affected nerve-centres results, leading to disturbance, but not to complete abolition of their functions. The embolic theory is believed especially to apply to those cases in which chorea accompanies acute rheumatism. When this disease attacks young persons, choreic symptoms are very liable to arise. Occasionally signs of endocarditis or pericarditis occur along with chorea, and also a high

temperature, but no joint-symptoms. It is highly probable, however, that the derangement of the vascular supply, and of the nutrition of the nerve-ganglia, which leads to chorea, may result from other causes besides embolism, such as slight local disease or hæmorrhage; disease of the vessels; mental shock; reflex irritation conveyed from some distant part; or an impure state of the blood. Some writers have maintained that chorea is due to a certain definite change in the blood, and that the complaint is allied to the acute specific diseases. In many cases anæmia is observed. Apart from rheumatic fever, by far the most frequent *exciting cause* of chorea is a sudden fright, especially when acting on a child previously weak and anæmic. The complaint may, however, arise from other forms of emotional disturbance, or from imitation, when children associate with others who are suffering from chorea; from injury to the head or to some local nerve; reflex irritation connected with worms; painful second dentition; masturbation; menstrual derangements; or pregnancy. Frequently no obvious cause can be made out, except the condition of the blood and of the general system.

There are some important *predisposing causes* of chorea, viz., the female sex; early age, especially from 5 to 15; hereditary tendency to various neuroses; bad living and unfavourable hygienic conditions, with consequent imperfect nutrition; a recent attack of some acute lowering illness; and a damp and cold climate or season. Anomalous choreiform movements may occur at any period of life, in connection with various organic cerebral diseases. Certain movements observed in children, and also in adults, are merely the result of a bad habit, such as frequent closure of the eyelids, or twitching of the mouth.

SYMPTOMS.—Chorea is characterized by peculiar persistent involuntary movements of various muscles, partaking of the character of clonic spasms; with loss of control over voluntary actions, the will appearing to have its influence over the muscles diminished, while co-ordinating power is impaired. The complaint generally runs a definite course, though of variable duration, the symptoms setting in gradually; reaching their height in about two or three weeks, at which they remain for a variable time; and then subsiding. Sometimes, however, chorea remains as a chronic condition. The first signs which attract notice are that the patient seems restless and fidgety, cannot keep quiet, jerks one of the limbs about occasionally, halts or drags one of the legs in walking, makes grimaces, performs various acts awkwardly, or drops and breaks things. The phenomena of the established disease are very characteristic. The term "insanity of the muscles" has been well applied to the absurd, disorderly, involuntary movements which are observed. As a rule they are moderate in intensity, and not painful; they exhibit great variety in combination, being not mere jerks of the muscles, but more like restless movements, indicating complex co-ordinations, and often conveying an idea of purpose or design. The head is moved about in various directions; the face exhibits all sorts of ridiculous smiles, frowns, and grimaces; the tongue is often thrust out and coiled and then withdrawn again, or pushed into the cheek, or drawn into the throat, as if an attempt were being made to swallow it. The shoulders are jerked up, and the arms

thrown about, while various fidgety movements are carried on with the hands and fingers. The legs are frequently unaffected, being in all cases much less disturbed than the arms. Respiratory movements are infrequent, jerky, and irregular, the natural relations of the abdominal and thoracic movements being perverted during breathing; sometimes there is a dry nervous cough or grunting sound. It does not often happen that the muscles of the trunk seem to be much affected, but choreic patients are usually unable to sit or lie quietly for any length of time. The muscles of the larynx are rarely implicated, those of the pharynx never. Very commonly these involuntary movements commence and are more marked on one side than the other; or they may be entirely unilateral—*hemicorea*, or even confined to one limb. They are much intensified by attention being directed to them, as well as under the influence of emotion. A strong effort of the will or a deep inspiration may temporarily control them, but they become worse afterwards. During sleep they cease, but may be excited under the influence of dreams.

The want of control over the voluntary movements is seen in every act which the patient performs, such as walking, holding out the hand, putting anything to the mouth, eating or drinking, smiling, attempting to take hold of or to carry any object, which is generally allowed to fall or is thrown down. Articulation is commonly indistinct and jerky. Micturition may be difficult, on account of the jerking of certain muscles. The sphincters are never affected. The muscles are in a state of decided weakness, amounting to slight paralysis. A sense of fatigue and nervous exhaustion is usually experienced; while aching in the limbs, headache, and pains in the back are often complained of. The expression seems to point to some degree of mental defect, but this is mainly due to the movements of the muscles of the face, though in many cases, especially if the disease is of long duration, the intellectual faculties become somewhat obscured.

The *general* health is almost always below par, anæmia being often a prominent feature in cases of chorea. Temperature is normal unless the disease is associated with some pyrexial condition. The digestive organs are out of order in many cases. The urine is usually concentrated at first; contains excess of urea; and frequently deposits urates abundantly, as well as oxalates and phosphates sometimes. The state of the heart requires special consideration. In all cases of chorea it is desirable to examine this organ every day, if practicable. A basic anæmic murmur may be heard, but it is a mitral regurgitant murmur which must be specially looked for. This may be inorganic, resulting from irregular muscular action; or organic, associated with valvular lesion. The former is distinguished by its being usually not very loud or harsh, though it may be very well-marked; frequently by its irregularity, being heard at one time and not at another; and by its disappearance as the patient improves. An organic murmur is in many instances evidently connected with an attack of rheumatic endocarditis, but it is important to remember that this may be set up in cases where there is no obvious implication of the joints. Dr. Dickinson has advanced the opinion that endocarditis may be the consequence of chorea, being brought about by the irregular action of the heart.

Cases of chorea are occasionally met with in which the symptoms present an extremely acute and aggravated character, the spasmodic movements being excessively violent and constant, and extending throughout the body. The patient is unable to swallow or to perform any voluntary act, and becomes greatly distressed and exhausted, sleep being rendered impossible. Death ensues if the movements do not abate, often preceded by adynamic symptoms, delirium, or coma, but the intellect may be clear almost to the last. Two such fatal cases, occurring in girls about the period of puberty, have come under my notice, and similar attacks have been observed in connection with parturition.

DIAGNOSIS.—The symptoms of well-marked chorea are so characteristic, that it is scarcely possible to make a mistake in diagnosis, and therefore no special remarks need be made on this subject.

PROGNOSIS.—Chorea almost always terminates in recovery, except when it assumes the severe form alluded to above. No definite opinion as to duration should be given. The circumstances favourable to a speedy recovery are that the disease is due to some condition which is amenable to treatment; that this is commenced at an early period; and that the patient can be placed under proper sanitary conditions. The danger of the development of the cardiac complication should always be borne in mind. Chorea greatly increases the danger from acute rheumatism.

TREATMENT.—It is difficult to estimate the value of remedies in the treatment of chorea, as the complaint so often tends towards spontaneous cure. The indications which should be primarily attended to are:—
 1. To get rid of any obvious cause of reflex disturbance. 2. To regulate carefully the diet and the state of the digestive organs, especially maintaining a free action of the bowels. 3. To improve the general health and quality of the blood, by nutritious food; proper hygienic conditions; change of air; cold or tepid bathing, or the douche, especially applied over the back, with friction afterwards; and the administration of some preparation of iron, particularly if the patient is anæmic. Many cases do remarkably well under the use of ferruginous preparations, especially the sesquioxide, tincture of sesquichloride, ammonio-citrate, or carbonate. A great many supposed *specifics* have been introduced for the cure of chorea, the chief of these including salts of zinc; liquor arsenicalis; tincture of belladonna; conium-juice; hydrate of chloral; tincture of cannabis indica; hypophosphites; Calabar bean in the form of powder, extract, or tincture; a combination of morphia with strychnia; and chloroform by inhalation twice or thrice daily. From personal experience I do not think that any one of these remedies is applicable for all cases, but one or other of them may be found of service in different instances. The application of ice to the spine; the passage of a slight constant galvanic current along this region; and subcutaneous injection of curare, are among other special modes of treatment which have been advocated. The movements may often be diminished by proper discipline, and are greatly improved by gymnastic exercises. When the disease comes under treatment in its very early stage, some practitioners believe that they can check its course by exciting a free action of the skin by means of warm or hot-

air baths; followed by saline medicines, or by small doses of tartar emetic. Others employ *emetics* at the outset. Should sleep be much disturbed, some *narcotic* must be given. If the movements are very severe, it will be well to let the patient sleep on an air-bed or water-bed. Chorea complicating acute rheumatism usually needs no special treatment. Those dangerous cases in which the movements are extremely violent are but little amenable to any treatment. Inhalation of chloroform; subcutaneous injection of morphia, or, perhaps, of curare; and supporting the patient, enemata being employed if necessary, seem to me the most reliable measures to be adopted in such cases.

CHAPTER LXIII.

TETANUS—LOCK-JAW.

ÆTIOLOGY AND PATHOLOGY.—Though almost always of *traumatic* origin, and therefore occurring in surgical practice, a brief description of tetanus is needed in this work, as it occasionally comes under the notice of the physician as an *idiopathic* affection, resulting from a person being exposed to cold or wet, sleeping on damp ground, or becoming chilled when perspiring; or attacking infants soon after birth. It is probably a functional disorder of the spinal cord, dependent upon peripheral nerve-irritation, which leads to reflex disturbance. The condition of the cord has been generally regarded as one of undue excitation, but Dr. Ringer and Mr. Murrell have advanced the view that it is in a depressed state. Certain morbid appearances have been described in the spinal cord, but they cannot in the present state of knowledge be said to be at all characteristic.

SYMPTOMS.—The peculiar features of tetanus are persistent tonic spasm or rigidity of the muscles; with extremely painful paroxysms of cramps occurring at intervals. The patient first complains generally of pain and stiffness behind the neck, which increases until the muscles of this part become fixed, the head being drawn back. Then trismus or lock-jaw sets in, and swallowing becomes difficult. Next the rigidity extends to the muscles of the trunk; and finally all the voluntary muscles may become involved, except those of the hands, eye-balls, and tongue. They feel hard, tense, knotted, and rigid. The body is generally curved backwards—*opisthotonos*; but may be rigidly stretched out—*orthotonos*; bent forwards—*emprosthotonos*; or laterally—*pleurosthotonos*. A very painful feeling of constriction is experienced in the epigastrium, shooting towards the back. Soon paroxysms of painful spasms commence, at first slight and occurring at long intervals, but becoming rapidly more frequent, intense, and prolonged, so that they are excited by any slight disturbance, such as a touch or a noise, or even come on spontaneously, at last being almost constant. During these fits the patient experiences great distress and suffering; the muscles stand out and become extremely hard, and the back is often so curved

that only the head and heels touch the bed; the countenance presents the "*risus sardonius*," and has a peculiar aged expression, combined with that of intense anguish. Breathing is arrested, owing to the fixation of the respiratory muscles, this causing an extreme feeling of oppression and impending suffocation, but the act of respiration is comparatively free in the intervals. The voice is weak. During the attacks there is much heat and sweating; and the pulse is very frequent and small. Soon it becomes impossible for the patient to swallow anything, though often feeling very hungry and thirsty; while the mouth is clogged with viscid mucus. Sleep is entirely prevented. There are no head-symptoms, and the intellect remains undisturbed. The pupils are dilated. Cutaneous sensation is not affected, but there is increased reflex excitability. The power over the sphincters is retained; constipation is generally present, and micturition is often difficult. Death is a very frequent termination, either from sudden or gradual apnoea; from asthenia, in consequence of exhaustion and want of support; or from both causes combined. The temperature in many cases rises to a very high degree before death, and continues to ascend after death. Recovery occasionally takes place, but convalescence is very slow. Temporary remissions not uncommonly occur, which are apt to mislead as to the ultimate issue. Tetanus now and then assumes a somewhat chronic course. It is usually less acute in its progress when idiopathic than when traumatic.

DIAGNOSIS.—Strychnine-poisoning is the chief condition with which tetanus is likely to be confounded; for their distinctions reference must be made to toxicological works. The complaint might possibly be mistaken for hydrophobia; for acute spinal meningitis; or for certain cases of hysteria.

PROGNOSIS is extremely grave, as may be gathered from what has been previously stated, but the disease is not necessarily fatal.

TREATMENT.—The only measures which seem to me of any service in idiopathic tetanus are to use warm, vapour, or hot-air baths freely; to administer subcutaneous injections, either of morphia, curare, or nicotine; to relieve the spasms by inhalation of chloroform; and to support the patient by means of liquid nourishment and stimulants, administered in the form of enemata when they cannot be swallowed. All sources of disturbance must be removed, and the patient kept perfectly quiet. The application of ice to the spine has been recommended, but in one case which came under my observation no good effects whatever resulted from its employment.

CHAPTER LXIV.

ALCOHOLISM.

ÆTIOLOGY.—The injurious effects produced upon the system by the abuse of alcohol are but too well known. They are the result of its direct irritant action; of its influence on the vaso-motor nerves; of the

circulation of its own poisonous elements, or of those derived from its decomposition, through the various organs and tissues; and of its interference with tissue-metamorphosis, oxygenation, and nutrition. The exact effects will depend on the nature, quantity, and strength of the stimulant indulged in. Spirits do by far the greatest harm, especially when taken in frequent drams, strong, and on an empty stomach. Alcoholism is most frequent in males; and in those who from their occupation are exposed to intemperance, such as draymen, potmen, or cabmen, or whose calling is a lonely or a sedentary one. It is also predisposed to by various conditions which depress the nervous energy, such as working or sleeping in a hot and vitiated atmosphere; excessive mental work; anxiety or worry; or excessive venery. Persons who suffer severe pain, and hysterical individuals are very likely subjects to drink to excess. In not a few instances there seems to be a hereditary tendency to alcoholism, or to some neurosis, such as epilepsy or mania.

SYMPTOMS.—Cases of alcoholism may be included under the following groups:—1. *Acute alcoholic poisoning*, the symptoms being those of narcotic poisoning. 2. *Delirium tremens*. 3. *Chronic alcoholism*. 4. *Acute mania*, in which the patient is extremely violent and dangerous, and has a fixed delusion. 5. *Acute melancholia*, with suicidal tendency. 6. *Oinomania*, where there is a constant craving for drink, which breaks out at intervals into an uncontrollable propensity, the moral sense being entirely deadened, so that the subjects of this condition will do anything in order to obtain drink. Only *delirium tremens* and *chronic alcoholism* can be specially considered here.

Delirium Tremens.—This condition may come on under the following circumstances:—1. From mere excessive drinking in a temperate person. 2. An individual who is accustomed to drink freely gets very drunk. 3. A habitual tippler, who without being actually drunk is always more or less fuddled from saturation with alcohol, experiences some slight disturbance, especially of a traumatic kind; or delirium tremens may arise in such persons even without any apparent cause. 4. From deprivation of proper food, with moderate indulgence in stimulants. 5. In consequence of suddenly cutting off the supply of stimulants from an individual who has been accustomed to drink freely, especially if old or debilitated. 6. As the result of inhalation of fumes from a distillery, it is said (?). Most cases of delirium tremens follow abuse of spirits.

Generally delirium tremens is preceded by *premonitory* indications, especially disturbed sleep or absolute insomnia; general discomfort and feebleness; agitation and tremulousness; mental confusion and inability to fix the attention; timidity and lowness of spirits. The alimentary canal is commonly disordered, as evidenced by anorexia, foul tongue and breath, unpleasant taste, and constipation with unhealthy stools.

The actual symptoms of delirium tremens are usually very characteristic. The patient is either quite sleepless, or only obtains short uneasy dozes. The mind is in a state of general confusion, restlessness, and excitement, and though it may be possible to attract the attention of the patient for a moment, and to obtain a sensible answer

to a question, he speedily wanders off and talks ramblingly and incoherently, there being a kind of busy delirium. A variety of mental delusions, illusions, and hallucinations usually exist, the patient fancying he sees or hears all sorts of objects and sounds, often of a hideous character; or distorting in his imagination what he does see and hear into strange and horrible forms and noises. These delusions are generally transient and changeable, but occasionally the patient fixes upon one, and reasons about it. Further, the mental condition is one of combined irritability, marked cowardice, sense of dread, and suspicion. The patient has an anxious, wandering expression, and looks upon everybody around with terror and distrust, imagining that they are trying to poison or otherwise injure him; or fears lest he may do an injury to himself, and has a great sense of alarm as to what is going to happen. These feelings may culminate in fits of violent mania, attended with extreme muscular effort and a wild expression, the patient trying to injure those around, to jump out of the window, or to do various other acts with the view of escaping from some imaginary enemy. There is usually no complaint with reference to the head. Creeping sensations over the skin and other paræsthesiæ are common, and the patient often fancies he sees or feels horrible insects crawling over him. The prominent symptoms connected with the muscular system are restlessness, carphology, and general tremors, the latter being especially observed in the hands and tongue. After fits of violence the patient is much exhausted and prostrated. The pupils are generally dilated and sluggish.

The important *extrinsic* symptoms in delirium tremens are profuse perspiration without fever, the sweat having often a very disagreeable smell, the skin feeling moist and clammy, especially that of the palms, or being even drenched; a weak, large and soft, or small and frequent pulse, the sphygmographic tracing often exhibiting marked dirotism; and disorder of the alimentary canal, as indicated by foulness of the mouth and tongue, which are covered with sticky mucus, peculiarly unpleasant breath, complete loss of appetite, much thirst, nausea but rarely vomiting, and constipation with offensive stools; the urine is sometimes much diminished in quantity, and is deficient in phosphates and urea, but often deposits urates on standing.

Recovery is in many cases preceded by restoration of sleep, but this by no means necessarily leads to a favourable termination. In fatal cases typhoid symptoms frequently set in, with a dry brown tongue, sordes on the teeth, and low nervous phenomena, such as muttering delirium, epileptiform convulsions, and coma. Pneumonia or some other inflammatory complication may arise. Sometimes death results from sudden collapse.

Chronic Alcoholism.—Various grades of this condition are to be constantly seen, especially in hospital practice. A very able description of the phenomena observed has been given by Anstie. The ordinary signs may be summed up as follows:—*I. Nervous phenomena.* These include muscular restlessness and fidgetiness, culminating in tremors, beginning in the limbs, at first slight and controlled by an effort of the will, but afterwards becoming more marked and constant, being worse in the mornings, and then diminished by

food and drink; insomnia, or very disturbed and unrefreshing sleep with horrible dreams; diffused dull pain or heaviness in the head, and sudden attacks of vertigo; disorder of the special senses, as evidenced by photopsia or *muscæ volitantes*, and noises in the ears; mental disturbance, indicated in the early period by mental disquietude, uncertainty of purpose and inability to fix the attention upon anything, indecision of character, a vague sense of dread, or fits of violent temper; later on by impairment of the mental faculties, in some cases very marked, the patient having horrible visions, or delusions as to people plotting his ruin, and exhibiting great cowardice with loss of moral power, and a particular tendency to tell falsehoods about drink; impairment of muscular co-ordination, which explains the sensation sometimes experienced by the patient, as if he were going to fall down a precipice when walking on firm ground. 2. *General appearance.*

The signs coming under this head are more or less obesity or emaciation, the former being chiefly observed in beer-drinkers, the latter, which may be extreme, in spirit-drinkers; flabbiness or a bloated aspect of the features, with red and watery eyes, yellowness of the conjunctiva from fat or jaundice, and often redness of the face with enlarged vessels, especially about the nose and cheeks, or acne. 3. *Disorder of the alimentary canal*, indicated by total anorexia or disgust for food, especially in the mornings, the patient often making this an excuse for taking stimulants, in order to "keep up" the system; thick dirty furring of the tongue as a rule, but not always; dryness and cracking of the lips; catarrh of the pharynx; peculiar and disgusting foulness of the breath; severe morning nausea or actual sickness; irregularity of the bowels, with foetid stools; and occasionally serious hæmorrhage from the stomach or bowels. 4. Symptoms due to *organic visceral changes* and to *degenerations*. These have been pointed out in previous chapters, and, as already stated, there is much difference of opinion as to the influence of alcohol in their production. There can be no doubt as to the direct effect of strong spirits upon the mucous membrane of the alimentary canal, and especially upon that of the stomach, these inducing congestion, chronic inflammation, fibroid changes, and glandular degeneration; or that alcoholic abuse tends to lead to fibroid and fatty degeneration, with atrophy of various organs and tissues, including the nerve-centres.

In very advanced cases of chronic alcoholism still more grave nervous symptoms are met with, such as absolute dementia; marked sensory paralysis in different parts; extreme muscular trembling, simulating paralysis agitans; general muscular weakness; paralysis or ataxia; epileptiform attacks; or finally coma. Such phenomena are necessarily attended with serious organic changes in the nervous system.

DIAGNOSIS.—*Delirium tremens* has to be mainly distinguished from acute mania or meningitis. The history of the patient, and the circumstances under which the affection occurs; the characters of the nervous and extrinsic symptoms; and the absence of any fixed delusion, generally leave no doubt as to the nature of the case. Sometimes acute alcoholism closely simulates low fevers. *Chronic alcoholism* should always be suspected if any of the symptoms mentioned are complained of, not forgetting digestive disorders, but especially should there be

morning sickness, insomnia, fidgetiness or tremors, mental restlessness, or disturbance of the special senses. Close enquiry is often needed in order to elicit a history of intemperance in these cases, many patients trying to conceal their evil habits in every possible way. Anstie enumerates the following nervous diseases as being particularly liable to be simulated by chronic alcoholism, viz., commencing general paralysis of the insane; paralysis agitans; lead-poisoning; locomotor ataxy; softening of the brain or cord; epilepsy; senile dementia; hysteria; and the nervous malaise associated with some forms of dyspepsia.

PROGNOSIS.—*Delirium tremens* usually terminates favourably. The chief unfavourable circumstances are:—A history of chronic indulgence in excess of alcohol, so that the system is more or less saturated; the patient being advanced in years, enfeebled in constitution, or suffering from organic visceral disease, especially disease of the kidneys; a history of previous attacks, particularly if they have been numerous; difficulty in getting nourishment into the system, either from the patient refusing food, or from assimilation being impaired; inability to procure sleep before the patient is much exhausted; an unfavourable condition of the pulse, as evidenced by the sphygmograph; the occurrence of typhoid or low nervous symptoms; and the development of inflammatory complications, especially pneumonia. In the early period *chronic alcoholism* can always be cured if patients will keep away from drink, but it is often a very difficult matter to get them to do this. When serious nervous symptoms have become developed, there is but little hope of improvement.

TREATMENT.—**Delirium tremens.** 1. In treating delirium tremens, the first object aimed at should be to *withdraw* or to *reduce the quantity* of all forms of alcoholic stimulant, so far as this is practicable, but especially of spirits and wine. In a large proportion of cases it has been found that no harm whatever results from cutting off stimulants completely, especially in young patients and in first attacks; in others they must be moderated as much as possible, being chiefly needed if the patient is a habitual drunkard, old, or feeble, or if there are signs of adynamia. It is well to keep to malt liquors, if it can be managed, but brandy may be required. At the same time it is highly important to introduce as much nourishment as possible into the system. Strong beef-tea, beef-juice, hot soups, milk, eggs beaten up, and other forms of nutritious food which are readily assimilated, must be given at frequent intervals, by night as well as by day. If the patient refuses food, white of egg mixed with iced water is useful, and nutrient enemata must be regularly employed. In the treatment of strong patients, especially if they are young and a large quantity of spirits has been taken, a brisk watery purgative is decidedly beneficial at the outset, but this is not advisable in all cases.

2. The next indication is to endeavour to *procure sleep* before the patient is exhausted. For this purpose certain drugs are most useful when employed in moderate doses, especially opium or morphia, the latter being best introduced by hypodermic injection (gr. $\frac{1}{8}$ to $\frac{1}{2}$); hydrate of chloral (gr. xx every hour or two); bromide of potassium (gr. xx every two hours); and extract or tincture of *cannabis indica*.

As a general rule I quite agree with Anstie and others in opposing the notion that "patients in delirium tremens require to be narcotised into a state of repose," but I have met with cases in which the only chance of recovery seemed to be in procuring sleep at any risk, and where the administration of considerable doses of morphia, combined with abundant nourishment, proved, I believe, the means of saving life. Other remedies employed in the treatment of delirium tremens are tincture of digitalis in large doses (3ij to 3i every four hours), originally introduced by Mr. Jones, of Jersey; capsicum, in the form of powder or tincture in full doses; tartar emetic in sthenic cases attended with wild delirium; and chloroform, either by inhalation or internally. Chloroform-inhalation carefully employed may be decidedly serviceable sometimes.

3. *Symptoms* often require attention in acute alcoholism, especially vomiting. Should there be adynamic signs, *stimulants* must be given, such as ammonia, ether, musk, or camphor, along with brandy. *Complications* may also call for interference, particularly pneumonia, which always needs a supporting treatment in these cases. A patient suffering from delirium tremens should be placed in a comfortable and well-ventilated room; kept perfectly quiet and apart from friends, only one or two trained attendants being permitted to be present, according as the patient is peaceable or violent; treated kindly, but with firmness; and constantly watched, lest he should injure himself. Mechanical restraint, such as that by means of the strait-waistcoat, is but rarely admissible, though it is needed now and then in cases of extreme violence.

Chronic Alcoholism.—In treating chronic alcoholism, there should in most cases be no hesitation in forbidding stimulants entirely, but especially spirits or wine. It is often, however, difficult to persuade patients to carry out this advice. A glass of good bitter ale or stout along with food may be useful in some instances, and Anstie recommended the latter at night in order to procure sleep. It is most important to induce the patient to take nourishment, and as there is generally a great distaste for food, small quantities of milk, concentrated beef-tea, soups, or meat-juices should be given at frequent intervals. It is wonderful, however, how soon the appetite returns in many of these cases when the intemperate habits are relinquished. If there is much sickness, an effervescent mixture may be given, or soda-water with milk. I have found a mixture containing bicarbonate of soda or nitro-muriatic acid with infusion of gentian and hydrocyanic acid— \mathfrak{m} iij—iv, very serviceable in many cases. Anstie recommended one or two grains of quinine twice or thrice daily. Marcet found oxide of zinc useful, beginning with gr. ij twice daily, and gradually increasing the dose. Others have much faith in tincture of capsicum. If there is much restlessness and sleeplessness, a full dose of bromide of potassium at night will generally procure sleep, or this drug may be given more frequently if necessary. Some practitioners prefer subcutaneous injection of morphia; hydrate of chloral; extract of cannabis indica; or a full dose of sulphuric ether. Baths are often serviceable in chronic alcoholism; and rest from occupation, with change of air, aids recovery materially. The bowels should be kept well-opened.

In advanced cases the treatment must be varied according to the

prominent symptoms present. Anstie found the long-continued use of good doses of cod-liver oil most beneficial, with hypophosphite of soda or lime if there is commencing paralysis of sensation; bromide of potassium should there be epileptiform convulsions; and very minute doses of strychnine when marked muscular tremor is observed.

CHAPTER LXV.

ON CERTAIN FORMS OF METALLIC POISONING.

I. LEAD-POISONING—SATURNISM.

ÆTIOLOGY.—The introduction of lead into the system is most important in connection with certain occupations in which this metal is used, saturnism being especially common among painters, plumbers, and workers in white-lead. Sometimes it acts as a poison through being taken in water kept in leaden cisterns, in cider, in adulterated articles, or medicinally; or it may be inhaled from fresh paint; or now and then it gains access into the body in curious ways, as from using adulterated snuff, or rubbing the ointment into the skin. As a rule the metal is either swallowed or inhaled, and often enters the system by both the alimentary canal and the lungs. It becomes in time deposited in the various organs and tissues, but especially in the muscles, nerves, and nerve-centres, impairing their nutrition, the muscles becoming the seat of marked fatty degeneration and atrophy.

SYMPTOMS.—Certain objective appearances are usually very obvious in connection with chronic saturnism, viz., the so-called blue-line on the gums at their junction with the teeth; a dirty brown or black incrustation of the latter, if they are not cleaned, with rapid tendency to decay; more or less emaciation, with a dry harsh skin, and a peculiar sallow, pale or yellowish tint of countenance, with yellowness of the conjunctivæ. The breath is generally offensive, and a sweetish taste is frequently experienced. In some cases the pulse is very infrequent and slow. The prominent clinical phenomena which may be associated with lead-poisoning may be summed up thus:—1. *Lead-colic*, having the characters of more or less severe intestinal colic, accompanied usually with a retracted abdomen; absolute constipation; nausea and vomiting; eructations; and hiccup. 2. *Disorders of sensation*, such as hyperæsthesia or hypæsthesia of different parts, numbness, formication, neuralgic pains, aching in the limbs and joints, and headache. 3. *Amaurosis*, either single or double, usually associated with other grave nervous symptoms, and accompanied with changes visible with the ophthalmoscope. 4. *Motor disturbance*, in the way of tremors, epileptiform convulsions, or local paralysis. The most common and important variety of paralysis is that of the extensors and supinators of the fore-arm, giving rise to *wrist-drop*: the upper limbs are, however, often affected more or less throughout, and the legs also in many cases, as well as

the muscles of other parts of the body. As a rule both fore-arms are implicated, but not equally. The muscles are generally considerably wasted, giving rise to a depression on the back of the fore-arm, and those of the hands may also be much atrophied, so as to make them assume the crow-foot shape. Sometimes they are strongly closed, as if the flexor muscles were rigid. The condition of electric contractility and sensibility has been considered in a former chapter. The predisposing influence of lead in the system with reference to gout has been alluded to in connection with that disease.

TREATMENT.—Preventive measures are most important in the case of those working with lead. They should be very particular as to cleanliness, especially in washing their hands and cleaning their nails before eating, and in cleansing their lips and teeth. Every precaution should be taken against inhaling particles of lead. I believe a good deal of the metal is often introduced during meals, and the practice of taking a small quantity of dilute sulphuric acid in water at these times may be useful, as this would form an insoluble compound with any lead entering the stomach. The bowels must always be kept well-opened. If there is any lead in the system, iodide of potassium may be given from time to time. Lead-colic must be treated in the same way as other forms of intestinal colic. The great remedy for getting the metal out of the system, which is the main object to be aimed at in all cases, is iodide of potassium, a soluble iodide of lead being formed, which passes away in the urine and other excretions. It must be given for a long time. Sulphur-baths are also said to be useful. Paralysis, neuralgic pains, and other nervous symptoms must be treated according to the principles previously laid down.

II. MERCURIAL POISONING.

Individuals who work with mercury are liable to peculiar tremors from the inhalation of this metal, and these have also occasionally followed its medicinal employment. There are the usual signs of mercurialization in connection with the mouth and general system. The tremors almost always begin in the upper limbs, being accompanied with numbness or formication and pains in the joints, but may afterwards extend to the legs, trunk, face, tongue, and respiratory muscles; in short, to all the muscles except those of the eyeballs. At first the movements are but slight, but afterwards they increase so as to become spasmodic or convulsive, voluntary acts being performed in a violently jerking or spasmodic manner. They are greatly increased by any mental excitement. Finally more or less trembling becomes constant, and the patient is rendered quite helpless as to voluntary movements, speech and breathing being also gravely affected. In most cases the tremors subside if the patient is supported in a sitting or recumbent posture, and they also cease during sleep. Stimulants diminish them temporarily, but they are worse afterwards. The tremulous muscles are decidedly weak. In very advanced cases serious nervous symptoms arise, such as sleeplessness, delirium, coma, or epileptiform convulsions.

TREATMENT.—As soon as any of the symptoms described appear,

the patient should immediately give up his occupation for a time. For the elimination of the mercury from the system, the chief remedies are warm, vapour, or sulphur baths; sulphur or iodide of potassium internally; and *purgatives*. Medicinal *diaphoretics* and *diuretics* may also be employed. For the nervous symptoms quinine, iron, opium, nitrate of silver, and galvanism are recommended.

CHAPTER LXVI.

SUN-STROKE—INSOLATION—COUP DE SOLEIL.

ÆTIOLOGY.—Long-continued exposure to the direct and powerful heat of the sun often gives rise to grave nervous symptoms. These are chiefly met with in soldiers, and of course cases of sun-stroke are by far most frequent in tropical climates, but several have occurred in this country during late years. There are certain powerful *predisposing causes*, viz., wearing heavy or tight clothing and accoutrements; physical fatigue and exhaustion; the state of system induced by overcrowding and bad ventilation; and deficiency of drinking water. Most authorities are of opinion that a moist atmosphere is worse than a dry one. The immediate cause of sun-stroke is believed to be interference with evaporation and radiation from the skin, so that the blood gets overheated, and thus exerts an injurious and depressing effect upon the nerve-centres.

ANATOMICAL CHARACTERS.—The only *post-mortem* appearances which have been observed in cases of sun-stroke are fluidity of the blood; some congestion of the brain generally; and extreme pulmonary congestion, with distension of the right heart.

SYMPTOMS.—Generally there are *premonitory* symptoms, viz., great heat and dryness of the skin, with a subjective feeling of burning or stinging, the temperature being often hyper-pyrexial; marked debility and sense of exhaustion; thirst and nausea; vertigo, but not often headache; conjunctival redness; frequent desire to micturate; and sometimes delirium or delusions. Dr. Muirhead describes three varieties of sun-stroke, as regards the actual attack, named respectively *cardiac*; *cerebro-spinal*; and *mixed*. In the first there is sudden syncope, often terminating in speedy death. The cerebro-spinal form is characterized by coma; hurried, laboured, noisy, or stertorous breathing; contracted and immovable pupils; reddened conjunctivæ; convulsions in many cases; tumultuous action of the heart, with a very rapid, and in a short time a feeble, compressible, and irregular pulse. The temperature may reach 112° or more, and continues to rise after death in fatal cases. Should recovery take place, sequelæ are liable to remain behind, such as constant headache, mental disturbance, choreiform movements, or a tendency to epileptiform attacks.

TREATMENT.—Attention should be at once paid to any premonitory symptoms of sun-stroke. As a rule the great remedy is the assiduous

use of the cold douche over the head, neck, and chest, many repetitions of which may be required, but care is necessary in its employment. It helps to lower the temperature, and to restore the breathing. The wet sheet with constant fanning; enemata of iced water; and application of ice to the shaven head and spine are also recommended. Subcutaneous injection of quinine has been found useful in some cases. The patient should drink iced water freely, if he is conscious. If coma persists, a blister may be applied to the nape of the neck or to the shaven scalp. The bowels should be freely opened by enemata. The patient must be properly supported by nutriment and stimulants; and medicinal stimulants may be useful, especially in syncopal cases. Inhalation of chloroform is recommended for the relief of severe convulsions.

CHAPTER LXVII.

ACUTE CEREBRAL INFLAMMATIONS.

I. SIMPLE OR PRIMARY MENINGITIS.

ÆTIOLOGY.—The *exciting causes* of simple meningitis are:—1. *Direct injury* to the membranes, especially from fracture of the skull. 2. *Disease of the cranial bones*, particularly of the temporal in connection with ear-affections. 3. Prolonged *direct exposure to the sun*. 4. *Excessive mental labour*. 5. *Erysipelas* of the head and face. 6. *Local irritation* from adventitious growths, &c. 7. It is said, *exposure to cold and wet*. 8. Certain *acute exanthemata* in rare instances. 9. Sudden *disappearance of chronic cutaneous eruptions* (?). Inflammation of the cerebral membranes is also a part of cerebro-spinal fever; and may result from extension upwards of spinal meningitis. The disease is most frequently met with in male adults. A hot climate and season; undue mental work, especially if combined with loss of sleep; a weak and exhausted condition of the system, from previous illness or any other cause; intemperate habits; and the presence of Bright's disease, are regarded as *predisposing causes*.

ANATOMICAL CHARACTERS.—As a rule acute simple meningitis involves the membranes extensively, but is most marked over the convexity of the cerebral hemispheres. It may, however, be localized, or be evident chiefly or solely about the base. When the dura mater is affected, which usually results from injury or bone-disease, the inflammation is localized, and the membrane may be softened and thickened, reddened, black and sloughy, or unusually adherent to the surface of the brain; occasionally exudation or pus collects between it and the bone, and if pus forms, it is apt to perforate the dura mater, and to escape into the arachnoid cavity. Sometimes also inflammation is set up in the venous sinuses, leading to the formation of a thrombus, which may soften into a purulent-looking fluid, and give rise to embolism and blood-poisoning. Generally in cases of meningitis the cerebral arach-

noid appears dry and parchment-like, and more or less opalescent or opaque; sometimes it presents over its surface a thin layer of exudation or pus. The pia mater is extremely red and vascular, more so in some parts than others, while frequently small extravasations are observed, with patches of opacity around. In the early period a small quantity of serum, clear or more generally turbid and flocculent, and sometimes blood-stained, is seen in the arachnoid sac and in the meshes of the pia mater. More commonly there is little or no fluid, but a soft yellowish opaque exudation, often more or less purulent-looking, covers the surface, being particularly abundant in the sulci between the convolutions and along the course of the larger vessels. When the inflammation affects the base, the exudation involves some of the cranial nerves. The brain frequently presents an inflammatory condition of the superficial layer of its grey matter, especially in prolonged cases, indicated by redness, softening, and adhesion to the pia mater. The ventricles are normal in many cases, but may contain excess of serum or pus, or their walls may be covered with exudation.

SYMPTOMS.—Acute meningitis is usually preceded by *premonitory* symptoms, such as increasing headache or a sense of heaviness; vertigo; disturbances of general sensation or of the special senses; irritability, with a feeling of depression and restlessness; or sickness. The immediate attack is in most cases ushered in by a marked rigor or feeling of chilliness, speedily followed by pyrexia and severe headache, with cerebral vomiting. In exceptional instances the first symptoms are epileptiform convulsions, hemiplegia, aphasia, or stupor ending in coma. The clinical phenomena of the established disease are divided into certain stages, as follows:—

I. Stage of excitement.—At this time the symptoms may be arranged thus:—*a. Local.* Intense and constant headache, in most cases chiefly frontal, of a tight or binding character, with sudden darting or plunging exacerbations, which may be so violent as to elicit sharp cries or shrieks, the pain being increased by any slight disturbance, such as movement, noise, or light; marked vertigo; great heat of head, with flushing or alternate flushing and pallor of the face, and conjunctival injection. *b. Mental.* Great irritability and unwillingness to be disturbed, with sleeplessness, culminating speedily in delirium, almost always of an active character, not uncommonly being almost maniacal, the expression being wild, staring, and savage, or sometimes indicating great terror, and the patient shrieking and gesticulating, or being very violent. Occasionally the delirium is more of a muttering kind. *c. Sensorial.* General hyperæsthesia; tingling or formication in various parts; diplopia or dim vision, marked photophobia, photopsia, or muscæ volitantes; tinnitus aurium, and undue sensibility to sound. *d. Motor.* General restlessness and jactitation; twitchings or spasmodic movements in various muscles, especially those of the face and limbs, either unilateral or bilateral; or sometimes general convulsive movements, rigidity, tetanic spasms, local or unilateral spasms. Slight strabismus is usually observed, and it may be very distinct, while the eyeballs move about convulsively or stare fixedly. The pupils are very variable, but most frequently contracted or oscillating. *e. Extrinsic.*

There is marked pyrexia, without prostration, the skin being very hot and dry; the temperature considerably raised; the pulse remarkably frequent, hard, and sharp; the tongue white, and the mouth clammy, with great thirst and loss of appetite. Cerebral vomiting is a prominent symptom; and also constipation as a rule, the stools being offensive and dark. Breathing is generally irregular and moaning. The duration of this stage may vary from one to fourteen days or more.

II. Stage of transition.—This stage is characterized by the cessation of the symptoms of excitement just described, with the development of those indicating failure of the cerebral functions, and there may be apparently a remarkable improvement at its commencement. Generally the change is more or less gradual, but may be very rapid, a sudden fit of convulsions occasionally ushering in the final stage. As a rule the headache, delirium, exalted sensations, and fever subside; while a tendency is observed towards heaviness, somnolence, or muttering stupor ending in coma, with cutaneous hypæsthesia or anæsthesia, and impairment of sight and hearing. Motor disturbances become more prominent and general, in the way of carphology, subsultus tendinum, twitchings or tremors, spasmodic movements or convulsions, or paralysis. The pupils become dilated and motionless. The body and limbs cool down considerably, though the head may still remain hot; the pulse is less frequent, but very variable, and sometimes intermittent; the tongue tends to become dry and brown. Respiration is irregular and sighing. Urine is retained and may overflow. These symptoms culminate in:—

III. Stage of depression, in which there is complete abolition of all the cerebral functions, as shown by absolute coma with stertorous breathing; general anæsthesia, with muscular paralysis and relaxation; great dilatation and immobility of the pupils; and involuntary escape of fæces and urine. The patient presents an aspect of extreme prostration and adynamia, the features being sunken and ghastly; the surface bedewed with cold clammy sweats; the tongue dry and brown; the teeth and gums covered with sordes; while the pulse is excessively rapid, thready, and fluttering. In this condition the patient sinks more or less rapidly.

Differences are observed in the symptoms according to the seat and extent of the inflammation. If it affects only one hemisphere, there may be hemiplegia. If it is localized, the symptoms are correspondingly limited. When the base of the brain is most affected, it is said that the pain is more sub-orbital and sub-occipital; the mental and sensorial excitement is less marked, delirium being comparatively slight and transient; special paralysis of some of the cranial nerves is observed; while coma sets in early, and speedily becomes profound. Ophthalmoscopic signs are evident when the inflammation is conveniently situated, namely, those indicative of neuritis or ischæmia, and hyperæmia is commonly present.

Local inflammation of the *dura mater*, due to injury or bone-disease, is generally very obscure in its clinical history. The symptoms which may indicate this condition are pain, at first localized, being often seated behind the ear, but gradually extending over the head;

local tenderness over this part in some cases, or painful œdema ; little or no cerebral disturbance at first, but in course of time gradual somnolence ending in coma, or sometimes delirium and convulsions ; rigors, which may be periodically repeated, with pyrexia ; diminished fulness of the jugular vein on the affected side, if a thrombus forms ; and signs of pyæmia, or of embolic deposits in other parts.

II. TUBERCULAR MENINGITIS—ACUTE HYDROCEPHALUS.

ÆTIOLOGY.—This variety of meningitis is immediately due to local irritation set up by tubercles in the membranes of the brain. Therefore all causes predisposing to tuberculosis may be considered as predisposing to tubercular meningitis ; and where a hereditary tendency exists, whatever leads to local excitement in connection with the brain, such as unduly forcing the mental faculties in young children, tends to give rise to the formation of tubercle in this part. Children are by far the most frequent subjects of tubercular meningitis, especially those from 2 to 10 years of age, but the disease may be met with from earliest infancy to old age, being not uncommon up to the time of puberty and in young adults. Hereditary predisposition can be traced in a large majority of cases. This complaint not unfrequently follows one of the exanthemata.

ANATOMICAL CHARACTERS.—Miliary tubercles are found in greater or less abundance in the meshes of the pia mater, often adhering to the under surface of the arachnoid. They are frequently whitish and opaque, or may be softened and yellowish in the centre. They may appear scattered all over the surface, but are principally seen about the base of the cerebrum ; in the fissures, especially the fissure of Sylvius ; and along the chief branches of the vessels. The membranes are injected, particularly the pia mater. The surface of the arachnoid feels sticky, and a thin layer of soft lymph or puriform matter can often be scraped off ; this substance usually collects in abundance between the arachnoid and pia mater, especially about the base and in the fissures. The pia mater is thickened, and its meshes are infiltrated with the same material or with serum. As a rule there is little or no fluid in the arachnoid sac. Occasionally the signs of inflammation are chiefly observed over the convexity. The ventricles of the brain generally contain a considerable quantity of colourless, usually somewhat turbid and flocculent serum, often amounting to some ounces in each lateral ventricle, and this leads to œdema, maceration, and softening of the surrounding brain-structure ; to dilatation of the spaces and their communicating channels ; as well as frequently to compression of the convolutions of the cerebrum against the skull, so that they appear flattened and pale. Sometimes when the dura mater is opened the brain gives way, and the serum escapes. The walls of the ventricles are generally covered more or less with fine granulations. The exact appearances vary considerably in different cases ; in some the signs of meningeal inflammation are most prominent ; in others the quantity of fluid in the ventricles is most striking. There is no necessary proportion between the amount of tubercle and of the products of inflammation. Tubercle is

generally present in other structures, and sometimes in the brain itself.

SYMPTOMS.—Tubercular meningitis in children is generally preceded for a variable period by *premonitory* symptoms indicative of tuberculosis; while nervous symptoms are often prominent, as fretfulness, drowsiness, sudden starting, screaming, grinding of the teeth during sleep, headache, vertigo, or a staggering gait. These may, however, be entirely absent; while in some cases the disease supervenes on long-standing tubercular mischief in other parts. The symptoms of the established disease are described as following certain stages, and these have been differently classified by different writers. Certainly they are often very indistinctly marked in practice, and cases present considerable variety in their clinical history. The meningitis may be very obscurely indicated, being but a part of general acute tuberculosis; or its special symptoms may be those which chiefly attract attention. The characteristic phenomena are usually those of basic meningitis, with general cerebral excitement; followed by total abolition of the cerebral faculties, owing to the pressure of the fluid on the brain-substance.

The *invasion* is in most cases more or less gradual, and not infrequently very insidious. Sometimes the disease sets in very rapidly or even suddenly. The chief invasion-symptoms which may be met with are severe vomiting; intense headache; rigors, followed by pyrexia; marked irritability, nervousness, and obstinacy or unreasonableness in behaviour; or drowsiness. Occasionally tubercular meningitis is revealed by sudden convulsions, delirium, coma, or paralysis.

The ordinary clinical history of the developed disease is more or less as follows:—The early symptoms are severe constant headache, generally frontal, increased by movement, light, or noise, with intense darting paroxysms, causing the child to scream or cry out, and to hold the head; vertigo, giving rise to staggering and a tendency to cling to surrounding objects; alternate flushing and pallor of the face, the expression being often frowning or sad, or sometimes vacant and stupid; heat of head; marked intolerance of light and sound; general hyperæsthesia or dysæsthesia; great irritability and peevishness, with unwillingness to be disturbed, to answer questions, or to take food; insomnia or very disturbed sleep; sometimes slight wandering at night, but no marked delirium; unsteady gait, with dragging of the limbs; constant restlessness; grinding of the teeth; alternate contraction and dilatation of the pupils; severe vomiting; usually obstinate constipation and retraction of the abdomen; complete anorexia, without any particular thirst, the tongue being furred, and the breath offensive; moderate but irregular pyrexia, the temperature not often rising above 101° or 102° in the evenings, the skin being usually harsh and dry, the pulse rather frequent, but easily hurried to 120 or more, and the urine concentrated, but very deficient in chlorides, phosphates, and urea. Subsequently the mental faculties become more disturbed, as evidenced by delirium in some cases, either wild and restless, or muttering; and increasing drowsiness, with tendency to stupor. General sensibility becomes impaired, and the hyperæsthesia of the special senses ceases, while signs are developed pointing to implication of the cranial nerves at the base

of the brain, such as dim or double vision or hemiopia ; tinnitus aurium and partial deafness ; twitchings about the face ; strabismus ; oscillation of one or both eyeballs ; dilatation, inequality, or marked oscillation of the pupils, these being not very sensitive to light. The face assumes a worn, aged, distressed expression, the eyes being half-closed. Vomiting ceases, and diarrhoea may set in. Fever diminishes, while cool sweats often break out, and the pulse becomes in many cases remarkably infrequent and slow, but at the same time extremely variable and fluctuating, as well as often irregular in rhythm and force. Respiration becomes sighing or moaning and irregular. Still later there is marked general motorial disturbance, as evidenced usually by violent, prolonged, and frequent fits of convulsions ; tetanic rigidity, the head being drawn back, boring into the pillow, or rolling from side to side ; sub-sultus tendinum ; tremulousness of the limbs ; local paralysis or hemiplegia ; or occasionally by cataleptic phenomena. The face exhibits grimaces, on account of the muscular twitchings, with partial paralysis ; the eyes are half closed, dim, and covered with a film. When not convulsed the child is generally picking at the bed-clothes, or boring the fingers into the ear or nostril. The pupils are dilated and motionless. The final symptoms include gradual anæsthesia of all the senses ; deepening coma ; general muscular relaxation, with slight twitchings ; involuntary passage of urine and fæces ; coldness of the extremities, with general cold sweats ; and an extremely rapid, feeble, and irregular pulse. Death may take place from gradual coma, or during a fit of convulsions. In some cases the temperature rises considerably before death, or it may sink much below the normal. The ophthalmoscope reveals hyperæmia of the disc, ischæmia, or optic neuritis ; but only in very rare instances have tubercles been seen in the choroid, a point which has recently been confirmed by the careful observations of Dr. Garlick. Sometimes the head becomes enlarged, the fontanelles at the same time being very prominent, and presenting pulsation if they are not closed up.

When tubercular meningitis affects only the convexity of the cerebrum, Dr. Gee states that the prominent symptoms are a constant convulsive state, with moderate pyrexia and a pulse which is rapid and very variable in its frequency.

The ordinary *duration* of cases of tubercular meningitis in children is said to be from 7 to 23 days. Rilliet states that when prodromata are wanting, it averages from 20 to 30 days. When the convexity is involved, the disease terminates in one or two weeks or even sooner. In the course of a case a remarkable remission in many of the symptoms is frequently observed, simulating recovery, but some of them still remain, and it is very important not to mistake this improvement for an indication of approaching convalescence.

In the *adult* tubercular meningitis is generally considered as being in most cases secondary to chronic tubercular disease, especially to pulmonary phthisis, the symptoms of which often improve markedly just before those of meningitis are developed. Gee states, however that *primary* tubercular meningitis is at least as common as *secondary*. The symptoms more or less resemble those observed in the child, the most prominent being severe frontal headache with darting paroxysms ;

heat of head, with redness of the face or alternate flushing and pallor, and suffused conjunctivæ; often a dull, bewildered, heavy, or stupid expression, with mental confusion; a tendency to somnolence and stupor, alternating with wild delirium; indisposition to speak, or sometimes sudden complete aphasia; photophobia and intolerance of sound; evidences of irritation or paralysis of some of the cranial nerves, such as twitchings or paralysis about the face, ptosis, dilated or unequal pupils, strabismus; convulsive seizures; paralysis of the limbs; and cerebral vomiting. Deep coma follows, with general paralysis, and involuntary passage of fæces and urine, terminating in death.

III. RHEUMATIC MENINGITIS.

The meningitis which exceptionally complicates acute rheumatism has been distinguished as a special variety, but it only requires to be just mentioned here. Its development is usually accompanied with marked diminution in the joint-symptoms. The symptoms are those of simple meningitis, but it is said that the early stage is less violent, and the progress of the case more rapid. It must be remembered that grave cerebral symptoms may arise in the course of rheumatic fever independently of any meningeal inflammation.

IV. ACUTE CEREBRITIS OR ENCEPHALITIS—CEREBRAL ABSCESS.

ÆTIOLOGY.—Inflammation of the brain-substance may result from :—

1. *Injury* caused by fractures, wounds, or mere concussion.
2. *Disease of the bones*, especially in connection with chronic ear-affections, or occasionally with acute disease of the internal ear.
3. *Extension* from meningitis.
4. *Local irritation*, by adventitious morbid products, extravasated blood, or spots of softening.
5. Various *acute and chronic diseases*, especially if attended with suppuration, the inflammation being then probably pyæmic or septicæmic in character. Thus cerebritis has been met with in low fevers, especially typhus; acute pneumonia; chronic pulmonary phthisis; dysentery; and in connection with abscesses in different parts of the body.
6. *Insolation*.
7. *Prolonged mental labour* possibly. Sometimes no cause can be made out.

ANATOMICAL CHARACTERS.—Cerebritis is described as *diffuse* or *general*; and *local*. The former does not imply that the whole brain is implicated, which is never the case, but merely that there is extensive inflammation of the superficial grey matter, this condition being only associated with meningitis, and evidenced by redness, softening, and adhesion to the pia mater when this is stripped off. Local cerebritis is limited to one or more spots of variable dimensions. Some pathologists regard this morbid change as being the invariable cause of *acute softening* or *ramollissement*, especially of *red softening*. As will be hereafter pointed out, however, it is far more likely that the condition thus described is in the great majority of cases due to other pathological causes. When resulting from inflammation, it is said that the specific

gravity of the softened portion is increased. It is supposed that the colour may become yellow or green, from infiltration of the affected tissue with exudation or pus. The most important termination of local cerebritis is the formation of an abscess, which only happens, however, in connection with injury, bone-disease, or pyæmia. Usually the abscess is single, but there may be several collections of pus, especially in pyæmic cases. The white substance in the centre of the hemisphere is its most common seat, but any part of the brain may be involved, and when the abscesses are numerous, they are usually situated chiefly near the surface. Their size varies as a rule from that of a pin's head to that of a nut or egg; but a hemisphere may be occupied by one large abscess, which alters its shape and flattens its convolutions against the skull. When there are several abscesses, they are usually small. The shape is irregularly round or oval. At first the walls are ragged, softened, or inflamed; but if the disease lasts for some time, a firm fibrous or fibro-cellular capsule is formed, which may attain considerable thickness, becoming lined by a smooth membrane. The pus may be tolerably healthy, yellow or green, or sometimes red from admixture of blood; but in old abscesses it becomes unhealthy, foetid, and alkaline, containing but few pus-cells, with abundance of granular matter. A cerebral abscess may burst in various directions, such as on the surface of the brain; into a ventricle; into the tympanum; or in rare instances externally. In other cases the contents become inspissated, cheesy, or calcified, and a firm capsule forms.

SYMPTOMS.—The special characters of the clinical phenomena of cerebritis, as distinguished from those of meningitis, are that they indicate but slight and brief excitement, or none at all; while signs of failure of the cerebral functions speedily set in. The *diffuse* form is always preceded and accompanied by symptoms of meningitis, and in proportion as these are but little marked and of short duration, and to the rapidity with which stupor and coma, sensory anæsthesia, convulsions, and paralysis set in, the more probable is it that the brain itself is involved. Pyrexia also is not so high as in meningitis. *Local* cerebral inflammation is always very obscure at the outset. Frequently there is a severe prolonged rigor at first, which may be repeated on several days with almost regular periodicity. Sometimes, without any particular previous symptoms, the patient is seized with an apoplectic or epileptiform seizure, or gradual coma sets in; occasionally sudden hemiplegia without loss of consciousness has been observed. As a rule, however, there are early symptoms, viz., deep and sometimes fixed headache, often considerable, of a dull character, but not intensified into violent paroxysms; vertigo; heat of head; restlessness and sleeplessness; a heavy expression; mental confusion; irritability; sometimes talkative, but not violent delirium; dimness of sight; partial deafness; sensations in various parts of the limbs of tingling, numbness, formication, or deep pain or coldness; general weakness and languor; with tremors, twitchings, rigidity, or paralysis of various muscles. The pupils present all possible variations. There is comparatively little pyrexia. Vomiting is not infrequent. The bowels may be very constipated, and the tongue much furred. Sometimes articulation is impaired, or the patient is disinclined to speak, or complete aphasia may be observed. The subsequent

symptoms in fatal cases are stupor, ending in coma; gradual loss of all sensation; convulsions, hemiplegia, or general paralysis, usually with rigidity or tetanic spasms; and involuntary escape of urine and fæces. Some cases do not end fatally, but permanent disorder of the mental, sensory, or motor functions usually remains. In pyæmia it is rarely possible to diagnose cerebral abscess; and in some instances the symptoms closely resemble those of some low fever. Very exceptionally a collection of pus in the brain bursts externally.

V. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

I. DIAGNOSIS.—*a.* Acute inflammatory diseases connected with the brain or its membranes have to be distinguished from various *extrinsic* diseases attended with severe nervous symptoms, and this particularly applies to tubercular meningitis occurring in children. The principal affections of this class with which these diseases may be confounded are the exanthemata, especially typhoid and typhus fever; pneumonia and other acute inflammatory affections; disorder of the alimentary canal in children, particularly if acute and attended with fever and marked cerebral disturbance; anomalous cases of fever with brain-symptoms; great exhaustion of the vital powers, especially as the result of bad feeding, prolonged diarrhoea, or some lowering illness; and various derangements giving rise to reflex convulsions or delirium. The *history* of the case, as revealing some cause of cerebral inflammation or of one of the other complaints mentioned above; the *age*, *constitutional condition*, and *hereditary tendencies* of the patient; the *mode of onset* of the attack; careful examination regarding the *symptoms*, particularly as to the degree and character of those referable to the head, and the presence or absence of indications of cerebral lesion in the way of motor or of sensory disorder, the intensity and course of pyrexia, the symptoms connected with the alimentary canal, and those characteristic of the various fevers; *physical examination* of the different organs; and the *course* and *progress* of the case, are the chief data to be relied on in diagnosis. It is frequently impossible in children to determine at first whether they are suffering from tubercular meningitis, or from one of the complaints above enumerated. Under such circumstances the only thing to be done is to watch the case carefully, and observe its progress, at the same time employing some judicious treatment, and the obscurity will in most instances before long be cleared up. *b.* Inflammatory diseases have to be separated from *other affections of the nervous system*, which give rise to signs of cerebral excitement. Acute meningitis in an adult may be simulated by active congestion, in which, however, the symptoms are but temporary and usually slight, with little or no fever; by delirium tremens; or by acute mania. In the last two conditions there is rarely much difficulty, if proper attention be paid to the previous history and the symptoms present. In mania the existence of one or more fixed delusions, and absence of fever or of signs of vascular excitement about the head, are important points in diagnosis. In doubtful cases the supervention of spasmodic and paralytic phenomena, or of coma, usually soon reveals

the existence of meningitis. Meningeal hæmorrhage and cerebral tumour have in rare instances been mistaken for tubercular meningitis. The symptoms of acute inflammatory softening and that due to thrombosis often closely resemble each other; and occasionally cerebral hæmorrhage simulates cerebritis at first. *c.* The diagnosis of *meningitis* from *cerebritis* and its consequences, and of *simple* from *tubercular meningitis*, calls for a few remarks. *Meningitis* and *cerebritis* are frequently more or less combined, but the latter is distinguished mainly by the symptoms of cerebral excitement being much less marked and of short duration, or even absent altogether; while those indicative of failure of the cerebral functions rapidly supervene; there being also much less local vascular excitement and general pyrexia. The chief circumstances by which *tubercular* is distinguished from *simple* meningitis are the age of the patient in many cases; the presence of signs of the tubercular diathesis, or a history of hereditary taint, and the absence of any other obvious cause of meningitis; the more marked and prolonged premonitory symptoms, with insidious mode of onset; the evidences of inflammation affecting the base of the brain chiefly at first, there being less psychical disturbance, and no wild delirium; the headache being more in severe paroxysms; the minor degree of fever, or of local vascular excitement; the special characters of the pulse; and the less rapid course.

2. PROGNOSIS.—Any *acute inflammation* in connection with the brain or its membranes is extremely dangerous, and in the great majority of cases the termination is fatal. It is exceedingly doubtful whether tubercular meningitis is ever recovered from, at all events when the disease is fully developed. If a case should terminate favourably, the cerebral functions are permanently impaired more or less.

3. TREATMENT.—Unfortunately direct treatment is of very little service in any form of acute meningitis or cerebritis, and my own experience of a good number of cases at the Liverpool Northern Hospital is decidedly opposed to the measures usually recommended by some high authorities, viz., bleeding; severe purging; mercurialization; and extensive blistering. The measures which are most likely to be useful in the early stage are to place the patient in a well-ventilated, cool, quiet, and somewhat darkened room, on a comfortable bed, with the head high; to enjoin perfect freedom from every kind of disturbance; to cut the hair very short, or even shave the head, and apply cold assiduously but cautiously, by means of the ice-bag or irrigation; to open the bowels tolerably freely, a dose of calomel or croton-oil being useful for this purpose, as well as the administration of enemata; to limit the diet to beef-tea and milk; and, if there are signs of vascular excitement, to apply a few leeches over the temples. Convulsions are best treated by bromide of potassium in full doses, especially in cases of tubercular meningitis. Opium must be avoided. In the later stages a blister may be applied to the nape of the neck, or a couple behind the ears, but the advantage of blistering the whole scalp, as has been advocated, seems to me very questionable. Should symptoms of adynamia set in, *stimulants* are needed, especially brandy, ammonia and ether, with abundant liquid nourishment; if the patient is unconscious, they may be injected between the teeth by means of a

syringe, or administered by enemata. Care must be taken throughout to keep the feet warm; to attend to thorough cleanliness; and to see that the bladder is properly emptied. Sinapisms and flying blisters over the limbs are recommended in order to endeavour to rouse the patient in the later stages, but they are of little use. Should meningitis arise in connection with rheumatic fever, application of sinapisms or blisters to the joints might be of service.

CHAPTER LXVIII.

DISEASES AFFECTING THE CEREBRAL CIRCULATION.

THERE are four groups of morbid conditions which may be referred to the cerebral circulation, namely:—1. Excess or deficiency of blood in the vessels of the brain—*Cerebral congestion* and *anæmia*. 2. *Cerebral embolism* and *thrombosis*. 3. *Cerebral* and *Meningeal hæmorrhage*. 4. *Diseases of the vessels*.—Only the first three groups need be specially considered here, for the diseases of the vessels will be sufficiently noticed incidentally in discussing these conditions, with the exception of one particular lesion, namely, aneurism, which it will be more convenient to consider along with tumours of the brain. It may be remarked that a supposed *syphilitic disease* of the cerebral vessels has of late attracted considerable attention, but the most recent observers affirm that the appearances described as being characteristic of this lesion are in no way peculiar to syphilis, and therefore for the present it will serve no useful purpose to give any description of them in this work.

Without entering at any length into an account of the peculiarities of the cerebral circulation, it will be expedient to notice here certain points which are of practical importance. There is little or no communication between the arteries of the brain, except at the circle of Willis. Even the finest branches of a particular artery, such as the middle meningeal, do not anastomose, and only communicate through capillary vessels. Moreover, the arterial branches supplying the central ganglia are distinct from those distributed to the surface of the brain; while the arteries of the convolutions give off long and short branches, which are quite separate, the short ones being distributed to the cortical grey matter, the long to the subjacent white substance. Hence, if any artery is blocked up, the blood is entirely cut off from the area which it supplies, and the resulting lesions are correspondingly limited. In the case of the middle meningeal artery, for example, this vessel may be occluded in its main channel, the whole region which it supplies being thus deprived of blood; or only in one of its branches, so that the cortical grey matter and subjacent medulla may be the seat of disease from this cause, while the basic ganglia are quite healthy, and the lesion may be confined to a very limited region. The ophthalmic artery comes off from the internal carotid, and so forms a communication between the anterior

and middle cerebral arteries, which come off from the same trunk, and the circulation in the eye-ball and other parts to which this artery is distributed. The internal ear is mainly supplied from the basilar artery. With regard to the veins, the ophthalmic vein opens into the cavernous sinus; nearly all the venous blood within the skull is conveyed away by the lateral sinuses, and their continuations the internal jugular veins; and the chief sinuses communicate by branches passing through foramina in the skull with the veins on the outside of the head and those of the neck.

I. CEREBRAL CONGESTION OR HYPERÆMIA.

ÆTIOLOGY.—The causes of hyperæmia of the brain are:—1. *General plethora*, especially that associated with excessive eating or drinking, and luxurious habits with want of exercise. 2. *Increased flow of blood* into the brain—*active hyperæmia*—from undue cardiac action, whether merely functional, or associated with hypertrophy of the left ventricle; local irritation, especially in connection with inflammatory affections; diminished resisting power of the arteries, particularly that accompanying vaso-motor paralysis, as from excessive mental labour, strong emotion, sun-stroke, or the effects of alcohol and other poisons; interference with the general arterial or capillary circulation, in consequence of which an extra amount of blood flows into the main arteries of the neck; or, it is said, atrophy of the brain. 3. *Interference with the escape of blood* out of the brain—*mechanical hyperæmia*—especially resulting from cardiac and extensive lung-affections; violent expiratory efforts with the glottis closed, as in coughing or straining at stool; hanging the head downwards; direct pressure upon the veins returning the blood from the brain, as by an aneurism or other tumour; or strangulation of the neck.

ANATOMICAL CHARACTERS.—The *post-mortem* appearances usually described as indicative of cerebral congestion are overloading of the venous sinuses and of the vessels of the meninges, including the finer branches as well as the larger veins, so that the pia mater appears extremely vascular and opaque; undue redness of the grey matter of the convolutions; and increased number and size of the drops of blood which are visible on making sections of the brain. The convolutions may be compressed, and the ventricles contracted. Niemeyer justly remarked that it is often difficult to decide whether the vessels of the membranes, and still more whether those of the brain-substance, have been congested during life. He considered that the number and size of the drops of blood on section depend chiefly on its fluidity, and that œdema may follow congestion, the brain-substance then becoming unusually pale, and presenting but few and small blood-spots. As a rule the signs of hyperæmia are equally distributed throughout, but sometimes they are more evident in some parts of the brain than others. Long-continued or repeated congestion leads to permanent enlargement and tortuosity of all the vessels; atrophy of the brain, with a moist and slimy condition of its substance; increase in the subarachnoid fluid; and, it is supposed, to hypertrophy of the Pacchionian bodies.

SYMPTOMS.—Persistent cerebral congestion is revealed ordinarily by more or less of the following symptoms:—Constant dull headache, not severe, felt all over the head, or chiefly at the vertex or behind; a sense of heaviness, fulness, and oppression in the head; vertigo, which is often a prominent symptom; some degree of mental disturbance, evidenced by dulness of intellect, confusion and slowness of thought, impaired memory, indifference, and indisposition for any effort or occupation; constant drowsiness, though sleep is unrefreshing and often disturbed by disagreeable dreams; photopsia, iridic colours, or specks before the eyes, or sometimes temporary diplopia or dim vision; partial deafness and noises in the head; a feeling of heaviness in the legs, especially after walking, with restlessness and fidgetiness, twitchings, or sudden startings; increased or impaired cutaneous sensibility; pains in the limbs and various paræsthesiæ, these disordered sensations being temporary and variable in their locality. These symptoms are rendered worse by taking a full meal, by mental effort or emotion, by physical exertion, and by the recumbent posture. There are often obvious signs of *pléthora* about the face and head, with throbbing of the carotids.

Occasionally grave symptoms arise from cerebral congestion. The most important are those characteristic of an *apoplectic* attack. Various combinations of symptoms may be met with, but the distinctive features of this *congestive apoplexy* are as follows:—1. Its onset is quite sudden; it reaches its full development at once; and almost always follows some act on the part of the patient which leads to increased congestion in the head, such as hanging down the head, coughing, or straining at stool. 2. The coma is rarely complete, there being usually some indications of sensation, or should there be absolute loss of consciousness, this lasts but a very short time. 3. There is generally partial bilateral motor paralysis; very rarely hemiplegia, or more marked paralysis on one side than the other. 4. Rigidity is never observed, but slight bilateral clonic spasms are not uncommon, or they may be unilateral. 5. Respiration is not stertorous. 6. The pulse is generally slow, infrequent, and full. 7. There are external signs of hyperæmia about the head and face. 8. Urine and fæces are not passed involuntarily. 9. Restoration is rapid and ordinarily complete, no permanent mental defect or paralysis of motion or sensation remaining. Some degree of mental confusion may continue for a time, or there may be general impaired sensation with muscular weakness, but these phenomena soon pass away. The patient may be subject to attacks of a similar kind. Occasionally cerebral congestion gives rise to *epileptiform* seizures; and in some conditions it is attended with delirium and fever.

II. CEREBRAL ANÆMIA.

ÆTIOLOGY.—Cerebral anæmia may be *partial* or *general*. The former may arise from obstruction of some arterial branch, especially as the result of embolism or thrombosis; or in connection with certain intracranial diseases, such as cerebral hæmorrhage or tumour, which either compress neighbouring arteries or capillaries, or give rise to surrounding œdema. Anæmia of the entire brain occurs under the following

circumstances:—1. In connection with *general anæmia*, from whatever cause this may arise, the blood being either deficient in quantity, or impoverished in quality and deficient in red corpuscles. 2. From *enfeebled or failing cardiac action*, cerebral anæmia being a prominent phenomenon of the syncopal state. 3. As the result of *withdrawal of blood* to other parts of the body, as in the use of Junod's boot. 4. Rarely from *obstruction or compression of the main arteries* supplying the brain. 5. In consequence of *the cranial cavity being encroached upon* by large tumours, hæmorrhages, and other morbid conditions; or by a fractured and depressed skull. 6. It is said, from *vaso-motor disturbance* affecting the arteries which supply the brain, these becoming consequently contracted.

ANATOMICAL CHARACTERS.—Cerebral anæmia is indicated by more or less deficiency or want of blood in the vessels supplying the brain; pallor of its substance, the white matter being very pale and shining; and by the absence or small number and size of the spots of blood usually visible on making sections of the brain-substance.

SYMPTOMS.—It is highly probable that the symptoms which occur in connection with several of the morbid conditions which affect the brain are to some extent due to local anæmia of its substance. This partial anæmia is, however, of most importance, and most strikingly evident in association with embolism and thrombosis, and the phenomena observed will be more appropriately described when these pathological conditions are discussed.

In *general cerebral anæmia* the symptoms may be simply those of more or less sudden syncope, viz., loss of consciousness, with pallor, dilated pupils, and other phenomena, in some conditions these being associated with distinct convulsive movements; or they may come on gradually. The phenomena in the latter case are usually those already described under anæmia, such as headache, dizziness, disturbed vision, tinnitus aurium, &c. (Vol. ii. page 83). A condition met with in children as a result of lowering agencies, such as long-continued diarrhœa, which has been termed *hydrocephaloid*, has also been attributed to cerebral anæmia, the symptoms simulating those of acute hydrocephalus. In cases of starvation, as well as in some instances of mere general anæmia, there may be marked mental excitement, restlessness, and delirium, which may end in a violent maniacal condition.

III. CEREBRAL AND MENINGEAL HÆMORRHAGE—SANGUINEOUS APOPLEXY.

ÆTIOLOGY AND PATHOLOGY.—Cerebral hæmorrhage is in the great majority of cases, excluding those of traumatic origin, the result of *structural changes in the minute vessels* which diminish their resisting power, viz., atheroma or calcification; fatty degeneration; the formation of minute aneurismal dilatations on the small arteries, associated with a fibroid change; or the state of impaired nutrition which is induced by debilitating diseases, such as typhus fever or scurvy. Frequently, in addition to this, the vessels are not properly supported, owing to

softening or atrophy of the brain-substance, and hence they are still more liable to rupture. Not uncommonly they give way spontaneously, but this event is far more likely to happen if a state of congestion is brought about in any way, but especially as the result of hypertrophy of the left ventricle, excited cardiac action, or interference with the return of venous blood from the brain. On this account cerebral hæmorrhage is liable to follow sudden effort; straining at stool; a fit of coughing; powerful emotion; hanging the head down; compression of the neck; exposure to the sun; a fit of drunkenness; a warm bath; or exposure of the surface of the body to cold. Among *predisposing causes* may be mentioned advanced age; hereditary predisposition to early senile changes in the arteries; luxurious habits with want of exercise; and a state of general plethora and want of tone. Should there be signs of marked degeneration in the arteries, particularly if these are combined with left cardiac hypertrophy or dilatation of the right cavities of the heart, and with renal disease, cerebral hæmorrhage is to be feared at any moment. It must be mentioned that *embolism* or *thrombosis* of a large vessel in the brain leads to capillary extravasation in the surrounding area. In very rare instances hæmorrhage into the brain has resulted from the rupture of a vascular tumour.

Traumatic injury is the usual cause of meningeal hæmorrhage, but blood may find its way from the brain into or beneath the pia mater, or into the arachnoid cavity. Another important cause of hæmorrhage into the meninges is the *rupture of an aneurism* involving one of the main arteries at the base of the brain, especially the basilar, middle cerebral, or one of the communicating arteries. Meningeal hæmorrhage also occurs in connection with the condition named *pachymeningitis*. Effusion of blood outside the dura mater is always due to injury.

ANATOMICAL CHARACTERS.—The situations in which blood may be found extravasated within the cranium are as follows:—1. Into the substance of the brain. 2. Within the ventricles. 3. In connection with the pia mater. 4. Into the arachnoid sac. 5. Between the skull and dura mater.

The pathological anatomy of hæmorrhage into the brain must be considered at some length. *Seat.*—This is by far most frequently the corpus striatum or optic thalamus. Occasionally blood escapes into the pons, cerebellum, convolutions or medullary substance of the cerebrum, crus cerebri, medulla oblongata, corpora quadrigemina, or corpus callosum. Sometimes a part of the brain, as the septum lucidum, is torn through; or the blood makes its way into a ventricle, or out on to the surface of the brain. *Amount.*—The quantity of blood extravasated varies from a few drops to several ounces, and the effusion may be so large as to alter the shape of a hemisphere, flatten its convolutions, and cause marked æsthesia around. *Number of hæmorrhages.*—As a rule there is but one extravasation, but occasionally two or more are observed, though very rarely on opposite sides. Not uncommonly remains of former hæmorrhages are seen. *Recent characters and subsequent changes.*—The blood may accumulate in the form of what is termed a *capillary hæmorrhage*; or as a distinct *clot*. The former presents numerous scattered dark-red points of extravasation in the midst of cerebral substance, which is either normal, or frequently of a yellow or

reddish colour, as well as softened, this condition constituting one form of *red softening*. A clot, if small, simply separates the brain fibres, but if it is large, the cerebral tissue becomes broken down and mixed with the blood, while the surrounding portion is torn, at the same time being often softened and discoloured from imbibition. At first the blood may be found to be quite fluid, or partially or completely coagulated into a soft clot. Subsequently it tends to set up inflammation around, and has been known even to give rise to an abscess. In favourable cases, however, the extravasation undergoes changes ending in its absorption. It separates into its fibrinous and serous portions; becomes decolorized by degrees, passing through stages of reddish-brown, brown, yellowish-brown, and yellow; or granular pigment and hæmatoidine crystals form. Proliferation of cellular tissue takes place around, forming a capsule, and the clot may in time be entirely absorbed, an apoplectic cyst remaining, containing fluid, often loculated, and this may also be removed ultimately, nothing being left but a firm, fibrous, pigmented cicatrix. It is even said that this may disappear, a loss of substance, with consequent diminution in the size of the brain, being thus occasioned. The nerve-fibres which lead from the seat of hæmorrhage to the spinal cord frequently undergo degeneration.

When blood collects in a ventricle it is not nearly so readily absorbed, and in many cases becomes organized. In connection with the membranes an extravasation is generally spread out, and forms a soft red coagulum. In its subsequent changes it becomes altered in colour, granular, and pigmented, the brain underneath being somewhat indurated. Finally it forms a depressed pigmented plate, with serum upon its surface.

The heart, vessels, and kidneys will be found diseased in many cases of cerebral hæmorrhage.

SYMPTOMS.—In a considerable proportion of cases of cerebral hæmorrhage *premonitory* symptoms have been noticed for a variable period, such as headache or a sense of heaviness in the head; vertigo; mental confusion and impaired memory; irritability of temper; disturbed sleep or drowsiness; disorder of vision or hearing; thickness of speech; slight or temporary limited paralysis about the face or limbs; local twitchings; impaired sensation or paræsthesiæ in various parts. These phenomena may be due to mere vascular disturbance; to the formation of minute thrombi; or to very small extravasations. The frequent occurrence of epistaxis has been considered an important premonitory sign of cerebral apoplexy; and also the discovery by the ophthalmoscope of clots in the retina. There are usually indications of degeneration of the vessels, as well as of cardiac disease and chronic renal mischief in many cases.

The precise clinical phenomena which result from the actual extravasation of blood into the brain differ very materially. This lesion never causes absolutely sudden death, though in rare instances a fatal termination has occurred within a few minutes. In the majority of cases the immediate symptoms which characterize cerebral hæmorrhage may be summed up as those of an *apoplectic seizure* with *hemiplegia*. The main features of the attack are as follows:—It may follow some

evident cause which leads to cerebral congestion, but often sets in spontaneously while the patient is perfectly quiet. The seizure is usually more or less sudden, though not absolutely so, being almost always preceded by some immediately premonitory symptoms, which occasionally last for some time, such as mental confusion, pain in the head, disorder of speech, unilateral numbness, pallor with faintness, or sickness. Sometimes a convulsion ushers in the attack. When fully developed the coma is usually very profound at first, and the deeper it is the more likely is an apoplectic fit to be due to hæmorrhage rather than other cerebral lesions. The accompanying phenomena of the comatose state in a considerable proportion of cases of sanguineous apoplexy are flushing or even some degree of lividity of the face, with a turgid condition and fullness of the veins; slow, laboured, irregular, or stertorous breathing, with puffing out of the cheeks in expiration; and throbbing of the carotids, the radial pulse being infrequent, slow, laboured, full, and soft. Sometimes, however, signs of shock are noticed, the face being pale, and the pulse rapid, small, and feeble. The temperature is frequently lowered. Hemiplegia exists on the side opposite the lesion, having the extent described in the chapter on paralysis, but in many instances this condition is not easy to make out at first, when the coma is very profound, the whole body being paralyzed for the time. Sometimes tremors or spasmodic movements are observed in the paralyzed limbs. The head and eyes are usually turned to the non-paralyzed side, the patient seeming to be looking over the shoulder on that side, and often both upper eyelids fall. The pupils vary much, but they are generally equal and somewhat dilated; sometimes they are unequal, or very large and insensible to light.

As regards the progress of the symptoms, the comatose state may end in death, which rarely happens under some hours, and not usually for two or three days, some cases lingering for four or five days or even longer. Urine and fæces are then passed unconsciously; and secretions accumulate in the air-tubes, attended with loud rhonchal sounds. On the other hand, in a good proportion of cases consciousness is restored more or less speedily, and when this happens the mind is found to be perfectly natural, or there is only slight mental confusion, which soon passes off. Occasionally delirium is observed; or the mental faculties may be permanently enfeebled, the patient sinking in time into a state of more or less dementia. The hemiplegia becomes evident on the return to consciousness, and when the right side is affected aphasia is common, being also occasionally observed in cases of left hemiplegia. Sensation is not nearly so much affected as motion usually, there being merely a certain degree of impaired sensibility, or of numbness and tingling in the extremities, and even these disorders usually disappear before long. Now and then, however, permanent anæsthesia is noticed, either over the whole side or in limited spots, which is an indication of severe lesion. There is usually no complaint of head-symptoms or disorder of the special senses, or if such exist, they speedily pass away unless the hæmorrhage is extensive. In a few days signs of more or less inflammation from irritation of the clot are generally developed, such as headache, heat of head, restlessness, slight delirium, disturbances of vision, and twitchings or spasmodic movements in the paralyzed parts.

These symptoms soon subside ordinarily, but violent inflammation may be set up, ending in extensive softening or abscess, indicated by a relapse into the comatose state, with general paralysis and involuntary evacuations before death, which event may take place from this cause in three weeks or even later. Should a case proceed favourably, the motor paralysis often diminishes greatly in time, the improvement following the usual course, but the restoration is seldom complete, certain muscles generally remaining permanently disabled. In other cases there is little or no improvement, and "late rigidity" may ultimately set in.

The clinical variations due to the *seat* of cerebral hæmorrhage may be gathered from what has been stated in the chapter on "Localization of Cerebral Diseases," but a few points may be noticed here, as well as the variations due to the *extent* of the mischief. As regards either *cerebral hemisphere*, the degree and duration of the comatose state depend mainly on the amount of the extravasation. Hence, if this is moderate, there may be only partial loss of consciousness, the patient exhibiting signs of sensation and perception, while the mental faculties are very speedily and completely restored. If the extravasation is very small, there is no impairment of consciousness at all, and the lesion is merely indicated by *sudden hemiplegia*; or this is noticed when the patient attempts to move in the morning, the hæmorrhage having occurred during the night. The degree and persistence of the paralysis depend on the seat of the extravasation, as well as on its extent. Thus a small effusion into either *corpus striatum* will give rise to hemiplegia, and if it is of some size the paralysis is permanent. It may happen that a clot is so small or so situated that it either gives rise to no symptoms whatever; or only to partial hemiplegia, from which recovery is often rapid and complete. Hæmorrhage into the *cortical substance* is said to be usually attended with convulsions, and subsequently by marked mental disturbance, meningitis being often set up. When a very large clot occupies a hemisphere, so that the opposite one is also interfered with, bilateral paralysis is produced, though it is not equal on the two sides, only some degree of weakness of the limbs being observed on the same side as the lesion. General paralysis may also result from extravasation into both hemispheres, but this is extremely rare. If there is extensive *laceration* of the brain, rigidity and muscular twitchings are prominent phenomena. In some cases no impairment of consciousness is observed at first, or this is only partial and of brief duration, but afterwards, owing to increase of the hæmorrhage, or to the rupture of another vessel, profound coma may set in, ending in death.

Ventricular hæmorrhage is attended with deep coma and general paralysis, as well as in some cases with convulsions or marked rigidity and twitchings; or, more commonly, these symptoms follow the signs of hæmorrhage into one hemisphere, which is very significant. Considerable extravasation into the *middle of the pons Varolii* causes profound coma; general paralysis; marked contraction of both pupils; and usually speedy death. The condition greatly resembles that resulting from opium-poisoning. Hæmorrhage into the *medulla oblongata* generally proves very rapidly fatal. When blood escapes into the *arachnoid sac* or *sub-arachnoid space*, the attack is usually not

so sudden, but the symptoms are very variable. At first premonitory symptoms are frequently present, such as severe headache, vertigo, partial loss of motion, somnolence, or impairment of intellect. Among the signs which may be regarded as most suggestive of this form of hæmorrhage are gradually-developed coma; hemiplegia without implication of the face, or paralysis beginning on one side and afterwards extending to the opposite one; the occurrence of convulsions, marked spasmodic contractions, or rigidity of the limbs; and the supervention of signs of severe meningitis in a few days. Sensation is rarely affected. When meningeal hæmorrhage is considerable, it may be impossible to distinguish this condition from extravasation into the substance of the brain.

IV. CEREBRAL EMBOLISM AND THROMBOSIS—SOFTENING.

ÆTIOLOGY AND PATHOLOGY.—The pathology of *softening* of the brain is much disputed, but I propose to treat of this morbid condition in connection with *embolism* and *thrombosis*, because it seems to me certain that cerebral softening is in the great majority of cases due to vascular obstruction thus induced. A cerebral *embolus* of any size generally has its origin in valvular disease of the heart, but it may come from an aneurism, or from a pulmonary thrombus. Minute emboli may also be detached from old clots, or from the inner surface of diseased vessels. The formation of *thrombi* is almost always associated with degeneration of the cerebral vessels; which, however, may be aided by a feeble state of the circulation, and by certain conditions of the blood.

The main pathological causes to which the different forms of *cerebral softening* have been attributed may be summarized thus:—1. Local inflammation of the brain-substance. 2. Obstruction of arteries or capillaries by emboli; of arteries, veins, or venous sinuses by thrombi. 3. Pressure upon one of the main arteries by a tumour. 4. A diseased condition of the walls of the small arteries and capillaries, narrowing their calibre, and interfering with the nutritive relation between the blood and tissues. 5. Diminished nutritive activity in the tissue-elements, leading to their degeneration. 6. Effusion of blood into the brain. 7. A peculiar chemico-pathological change in the brain-substance, attended with the liberation of phosphine and one or more of the fatty acids. This form of softening is said to be often observed around adventitious products and old clots, but occasionally is independent of these morbid conditions (Rokitansky). 8. Œdema of portions of the brain. 9. Atrophic softening, due to separation of nerve-fibres from their ganglionic communications. I have already expressed my own view as to embolism and thrombosis being by far the most frequent causes of cerebral softening, the nutrition of the part thus deprived of blood being impaired, sometimes to such a degree as to cause its actual death, œdema and capillary hæmorrhage also in some cases contributing to the process of softening. It must not be forgotten that the brain may become softened as the result of a *post-mortem* change. With regard to *predisposing causes* of cerebral softening, this

lesion is most common in advanced age, on account of the condition of the vessels, but when due to embolism it may be met with in young adults or even in children. Excessive and long-continued mental strain undoubtedly aids in its production, and it is by no means improbable that this may so disturb the balance of nutrition as of itself to give rise to softening of the brain.

ANATOMICAL CHARACTERS.—An embolus may lodge in one of the arteries before reaching the circle of Willis, and then, owing to the collateral circulation being readily set up, no permanent evil consequences ensue. Almost always, however, it passes into a branch beyond this circle, most frequently the *middle cerebral artery*, especially the left. The immediate result is anæmia of the portion of the hemisphere which this artery supplies, and as the result of the anatomical arrangement of the vessels previously described, this is followed by softening with cedema, while there is a determination of blood into the surrounding capillaries, which often give way, giving rise to capillary hæmorrhage, especially at the circumference of the affected part. The effects may partly disappear in course of time in young persons whose vessels are healthy and distensible, and it is not improbable that the consequences of embolism in the minute vessels are often recovered from. After an embolus has been lodged for some time, it may be difficult or even impossible to discover it.

In *arterial* thrombosis the vessels will generally be found extensively diseased, many of them being usually blocked up. This condition will also lead to anæmia and softening, but owing to the morbid state of the minute vessels, and to the fact that several of them are obstructed, there is no increased vascularity around the affected part as a rule, this portion of the brain being very pale, while, if a vessel of any size is obstructed, for the same reasons restoration cannot be expected. Thrombosis of the *veins* and *venous sinuses* is generally associated with inflammation, resulting from injury or from bone-disease. It may arise, however, from feebleness of circulation accompanied with blood-changes, the thrombus first forming in the superior longitudinal sinus, and then extending, leading to more or less effusion of serum into the ventricles and sub-arachnoid space, or, rarely, even to hæmorrhage here or into the brain-substance, but especially to scattered patches of red softening with capillary hæmorrhages in the grey matter of the convolutions, or occasionally to more extensive softening.

Three chief forms of *cerebral softening* are described, viz., *red*, *yellow*, and *white*, but the softened part may present numerous varieties of these tints, or even other colours, such as brown or greenish. The degree of diminution in consistence varies from what is scarcely appreciable to a condition in which the brain-substance is converted into almost a fluid pulp. It is determined by the aid of the finger; or by allowing a piece cut out of the softened part to stand, and observing how soon the angles round off, or pouring a stream of water gently upon it. The *seat* and *extent* of softening also vary greatly, and very different statements have been made as to the frequency with which different parts of the brain are involved, but the usual seats seem to be the corpus striatum, optic thalamus, central white matter of the hēmi-

sphere, and the convolutions. In *embolic* softening the left hemisphere is most commonly affected. The morbid condition is rarely well-defined, but shades off into the surrounding brain-tissue. A section appears to be swollen, and often rises above the surrounding level. A highly important character of all forms of cerebral softening, except, it is said, the inflammatory variety, is that the specific gravity of the softened part is considerably below that of normal brain-substance. Microscopical examination reveals more or less destruction of the nerve-elements, until in extreme cases no trace of them is visible; abundant granular cells, not of inflammatory origin, but chiefly derived from granular degeneration of the cells of the neuroglia or of nerve-cells; granular fatty debris; particles of myeline; blood-cells in some varieties of softening, or their remains in the form of pigment and hæmatoidine crystals. The capillaries often show signs of degeneration, and are in some forms of the disease dilated, or present little aneurismal swellings.

It is necessary to offer a few remarks respecting the three main forms of softening. *Red* softening may be inflammatory in its origin, but in the great majority of cases it depends upon obstruction of large arteries or venous sinuses. The tint at first may vary from pink to deep claret, being most intense in the grey matter. Afterwards it undergoes changes, assuming different hues of yellow, brown, chocolate, buff, &c. *Yellow* softening usually results from changes in the red variety, but the peculiar form due to the chemico-pathological change is described as being of this colour. *White* softening is considered by some pathologists as the ultimate condition of the red variety, but undoubtedly it is not uncommonly a primary form, especially in connection with extensive thrombosis and atheroma of the vessels. It is also observed in œdematous and atrophic softening.

Reparative processes may be set up after softening. On the surface of the brain circumscribed yellow patches—*plaques jaunes*—are produced, of tough consistence, implicating the grey matter of the convolutions. In the interior of the organ a cavity forms, bounded and traversed by a white or greyish or sometimes a yellowish vascular connective-tissue, which may divide the space into loculi, and these contain a milky fluid holding in suspension abundant fat-granules and corpora amylacea. This fluid may be absorbed, contraction and ultimate closure of the cavity subsequently taking place.

SYMPTOMS.—It will be requisite in treating of the clinical history of cerebral softening, to describe it under the two forms of *acute* and *chronic*. The latter is considered in the chapter on Chronic Diseases of the Brain.

Acute Softening.—Practically it will only be necessary here to indicate the respective symptoms of *embolism of the middle cerebral artery* and *thrombosis*. *Embolism* may occur at any age, being not uncommon in young persons; some morbid condition likely to originate an embolus can generally be discovered; while in most cases no premonitory head-symptoms have been noticed. The usual indications of the lodgment of the embolus in the brain are sudden loss of consciousness and evidences of shock; with hemiplegia, generally on the *right* side. The case may end fatally, or consciousness may return, but

the hemiplegia remains, aphasia being also of very frequent occurrence. The paralysis is rarely recovered from entirely, but power may be partially restored, especially in young persons. In a case mentioned in a former chapter which came under my notice, the leg recovered perfectly, but the arm, face, and tongue remained permanently paralyzed, and aphasia was also persistent.

Arterial thrombosis is met with either in old persons, or in those who are prematurely aged; and usually, but not always, well-marked signs of degeneration of the vessels of the limbs are obvious, along with a feeble heart and other evidences of decay. Commonly there have been marked *premonitory* symptoms, due to interference with the cerebral circulation, or to the formation of minute thrombi, similar to those described under Cerebral Hæmorrhage. The mode of attack varies, but is usually more or less *apoplecticiform*. Should a large artery, or several smaller vessels be rapidly obstructed, a sudden apoplectic seizure with hemiplegia occurs, frequently not distinguishable from sanguineous apoplexy. By far more commonly, however, the onset is gradual, there being marked mental disturbance of some kind before the coma supervenes, such as transient excitement, confusion of thought, irritability, or mild delirium, the patient often talking incoherently or acting strangely. There may be complete loss of consciousness for a brief period, but this condition soon passes away, and almost always when the patient is seen the coma is only partial, indications being afforded that sensation and perception are not entirely abolished. In some cases apoplecticiform attacks are repeated, with partial restoration in the intervals, absolute coma being ultimately developed, with general paralysis and involuntary passage of fæces and urine, death taking place in a few days. In others the mental faculties become by degrees considerably improved, even up to the previous standard; but as a rule the intellect remains markedly impaired, and this condition tends to become speedily worse and worse. There is frequently permanent aphasia or defect of speech. When sufficiently restored, the patient often gives indications of pain or uneasiness in the head; and of hyperæsthesia, dysæsthesia, or various paræsthesiæ in either or both limbs on one side. Hemiplegia is usually present, and during the apoplectic condition the head and eyes are often turned to the sound side. Sometimes the paralysis is bilateral, or is confined to one limb. Generally it is not complete, being also more marked in the arms than in the legs, and at the extremities of the limbs than in other parts. Early spasmodic contractions in the paralyzed parts are very common, in the way of clonic spasms, jerkings, or rigid flexion of joints, especially of the shoulder, elbow, and knee. The affected limbs are often exceedingly irritable on percussion. The paralysis is not likely to diminish. *Hemiplegia without loss of consciousness* is far more common in thrombosis than in cerebral hæmorrhage, and the paralysis may come on in a *progressive* manner, which is very characteristic, affecting first one limb and then the other, at the same time becoming more marked by degrees. Occasionally the early symptoms assume the characters of irregular epileptiform attacks occurring in rapid succession, attended with mental disturbance, ending in coma and hemiplegia. In other instances delirium is the prominent symptom at first, usually mild, sometimes violent, alternating with and finally

ending in coma. The subsequent course of cases of acute cerebral softening varies much ; many of them become very chronic, the patients gradually sinking into a state of imbecility, and being permanently bed-ridden and helpless ; the opposite side often becoming weak ; "late rigidity" setting in in the paralyzed muscles ; and nutrition being much impaired.

V. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

I. DIAGNOSIS.—With regard to the hyperæmic or anæmic disorders of the circulation of the brain, which give rise to the slighter symptoms, nothing need specially be said as to their diagnosis. Let it be borne in mind, however, that persistent symptoms pointing to the head, especially in persons at all advanced in years, should always lead to a careful investigation of the case. It not uncommonly happens that head-symptoms are complained of more or less constantly, such as headache or giddiness, and it becomes a question whether these depend upon some *extrinsic* disturbance, especially connected with the digestive organs, heart, or kidneys ; or upon congestion of the brain, or disease of the cerebral vessels. It is always well to give a cautious opinion under these circumstances. The general condition of the patient ; the presence or absence of marked symptoms referable to the alimentary canal ; the state of the heart, vessels, and kidneys, as determined by physical examination ; and the precise nature of the symptoms complained of, will usually render the diagnosis evident. Any sensory or motor disorder in the limbs, especially if always noticed on one side or fixed in the same spot, should be looked upon with suspicion. Again, slight nervous phenomena, which are often attributed to mere congestion of the brain, may be due to thrombosis of small vessels or to minute hæmorrhages. Care must also be taken not to mistake between cerebral congestion and anæmia. In further considering the diagnosis of these affections, it will be convenient to discuss them under the two main groups in which they are usually presented in practice.

a. The apoplectic condition.—This must be considered, not only with reference to cerebral diseases, but also to other causes by which it may be induced. The comatose state may either be developed more or less suddenly, while the patient is under observation ; or he may be found in an unconscious state. The first thing to be determined in a case of insensibility, of which the cause is unknown, is whether the condition is one of syncope or shock ; asphyxia ; or coma. The characteristic features of each of these conditions have been already described, and need not be recapitulated here. The ordinary causes acting directly on the nervous system which are to be borne in mind as likely to account for unconsciousness, the origin of which is not evident, are :—*a.* Injury to the head. *b.* Epileptic or other form of convulsive seizure. *c.* Uræmia. *d.* Poisoning by alcohol or opium. *e.* Sun-stroke. *f.* Certain affections of the brain or its membranes, namely, cerebral congestion ; hæmorrhage into the brain or meninges ; cerebral embolism or thrombosis ; and rapid serous effusion.

In endeavouring to arrive at a diagnosis, the following course of investigation should be pursued :—

(i.) Enquiry must first be made as to the *mode of attack*, and if there is any known *cause* for this. Thus there may be a history of injury, opium-poisoning, or alcoholism. On the other hand, the circumstances under which the seizure occurs may exclude such causes altogether, but it is important to bear in mind that symptoms of opium-poisoning may not appear until some time after the poison has been taken. Not uncommonly, however, the patient is found in a state of insensibility, and no history can be obtained. Should this happen in a house, it is requisite in any suspicious case to look for bottles which might have contained poison. If the attack has come on under observation, it is very important to ascertain whether it arose spontaneously, or followed some obvious cause, such as sudden effort or a fit of anger; whether it was sudden in its onset, or more or less gradual; if preceded or not by mental disturbance, local sensory or motor disorder, or other symptoms; and if any convulsive movements were observed at or soon after the beginning of the attack. This information affords much aid in distinguishing organic lesions from each other; while the occurrence of convulsions entirely excludes poisoning. The *age* of the patient should be ascertained, if it is known.

(ii.) In the next place a *careful examination of the patient* must be carried out, noting especially the following particulars :—*a.* The apparent age; general conformation and appearance, whether full and plethoric or the reverse; and if there are marked signs of decay. *b.* The colour of the face, whether indicating congestion or shock. *c.* If any signs of injury about the head can be discovered. *d.* Whether there are any indications that the attack began with convulsions, such as the tongue having been bitten. *e.* The odour of the breath, which may reveal alcohol, opium, or uræmia. *f.* The degree of insensibility, deep coma usually indicating hæmorrhage or poisoning. *g.* The state of the pupils, any inequality showing some cerebral organic lesion; while extreme contraction is a sign of opium-poisoning, though the same condition is now and then observed in cerebral hæmorrhage, and the pupils are greatly dilated at the close in cases of opium-poisoning. *h.* If there are any indications of unilateral motor disorder, looking especially for paralysis; turning of the head and eyes to one side; tremors; or spasmodic movements or rigidity. These afford evidence of some cerebral lesion, though their absence does not exclude this, while marked spasm or rigidity is in favour of plugging of vessels or meningeal hæmorrhage. *i.* The characters of the breathing, slow, laboured, and stertorous respiration being usually only observed in the profound coma of cerebral hæmorrhage or narcotic poisoning. *j.* The state of the pulse. It is highly important further to examine the heart and vessels. For instance, valvular disease or some other condition likely to give rise to embolism may be thus discovered; cardiac enlargement is often associated with cerebral congestion or hæmorrhage; in cases of thrombosis the heart is usually very weak or fatty; while marked degeneration of the vessels may accompany either hæmorrhage or thrombosis. The urine should also be tested, some of which may be withdrawn by the catheter if necessary. Bright's disease, however, may be associated with

uræmia, cerebral hæmorrhage, or thrombosis. The detection of alcohol in the urine has been considered useful in the diagnosis of alcoholic poisoning. If the patient vomits, the matters vomited ought to be examined in any doubtful case, and it may even be desirable to use the stomach-pump.

(iii.) The *progress* and *termination* of an apoplectic case often give much information as to its nature. Thus, hæmorrhage on a very extensive scale or into certain parts of the brain soon terminates fatally; and so usually does opium-poisoning. In a considerable experience of cases of alcoholic poisoning at the Liverpool Northern Hospital, I never knew one prove immediately fatal, even when the coma was very deep. The course of events also affords important help in distinguishing between cerebral congestion, hæmorrhage, and plugging of vessels.

There are some points of practical importance which demand notice. The greatest care should be taken not to pronounce a person merely drunk in whom there are signs that this condition exists, as there may be at the same time some serious injury to the head, or an organic lesion affecting the brain. Grave mistakes have not unfrequently been made in this matter. Alcoholic poisoning may be met with in very young children, even in infants in arms. It is sometimes difficult or impossible to determine whether comatose symptoms are due to some evident injury to the head; or to a sudden cerebral lesion which has caused the patient to fall, and has thus led to the injury.

b. The second group of cases which call for consideration here are characterized by *sudden or rapidly-developed hemiplegia without loss of consciousness*. This indicates either hæmorrhage into the brain; or plugging of vessels, especially from thrombosis. The probability is always in favour of the latter, and the diagnosis is still more certain if the paralysis is not suddenly complete, but increases and extends in a progressive manner.

2. PROGNOSIS.—The immediate prognosis of an *apoplectic seizure* due to cerebral lesion is always doubtful, and a very cautious opinion ought to be given, the case being thoroughly watched. If the coma is merely due to congestion, the patient will soon recover. The chief circumstances which increase the gravity of the immediate prognosis in cases of sanguineous apoplexy are:—advanced age of the patient, with very degenerate vessels; a history of previous attacks; the occurrence of convulsions at the outset, or of marked rigidity or spasmodic movements at an early period; a progressive character of the attack; very deep and prolonged coma, with involuntary passage of urine and fæces; general paralysis; great dilatation and immobility of the pupils, or extreme contraction; a very slow or rapid pulse; signs of profound shock, with feeble circulation, pallor, and cold sweats. As to the ultimate prognosis, supposing consciousness to be restored, this can only be determined by watching the case for some time and noting its progress; and the same is true when hemiplegia sets in without coma. Right hemiplegia is said to be less favourable than left. Anæsthesia affecting any part of the paralyzed limbs is a bad sign, as well as the occurrence of occasional severe pains. If no improvement is evident within a month; if the paralyzed limbs exhibit a marked tendency to permanent rigidity; and if electric irritability becomes impaired or lost, the prog-

nosis is very unfavourable. The leg may recover power while the arm remains permanently paralyzed. After cerebral hæmorrhage the mental faculties are often perfectly restored, even though the paralysis is persistent. It must be borne in mind that a clot in the brain may cause serious inflammation of its substance, and may thus prove fatal some time after the occurrence of the hæmorrhage.

Embolism or thrombosis is not so frequently immediately fatal as cerebral hæmorrhage, but the subsequent history is generally very unfavourable, both as regards the mental condition and the paralysis, especially in cases of thrombosis accompanied with extensive disease of the vessels, such cases often going on rapidly from bad to worse.

3. TREATMENT.—In the treatment of the minor symptoms due to congestion or anæmia of the brain, attention must be paid to the state of the blood and of the circulation. General cerebral anæmia may be obviated by improving the quality of the blood; and stimulating or giving tone to the heart. No special treatment can be directed to partial anæmia. Cerebral congestion may be relieved by keeping the patient on low diet; administering saline and other *purgatives*; avoiding any cause which is likely to give rise to the condition, such as overstudy; or, in appropriate cases, removing blood either locally or generally. The patient must be warned against wearing tight clothing about the neck, hanging down the head, straining at stool, and other causes which are likely to increase cerebral congestion, particularly if there are any indications that the vessels are in a diseased state.

Before describing the treatment of an *apoplectic attack* resulting from cerebral mischief, I would remark that in cases where the diagnosis is uncertain, it is desirable to empty the stomach at once by means of the stomach-pump, lest the symptoms should be due to some poison. In this class of cases the first principle in treatment ought to be not to interfere immediately and actively unless there is some clear indication for such interference. Formerly venesection was at once resorted to, and is now but too often followed as a routine practice. In many cases all that is necessary is to place the patient in the recumbent posture, if possible in bed, with the head high; to loosen all clothing about the neck and chest; to allow plenty of fresh air; and to enjoin perfect quiet. If the attack is merely due to congestion, recovery will soon follow. Should the case be one of hæmorrhage, with obvious signs of marked plethora, unquestionably venesection may be useful, but it is rarely needed; on the other hand, the condition is not uncommonly one of shock, and then stimulant enemata, heat and sinapisms to the extremities, and other measures for rousing the patient are indicated, particularly when the coma is due to plugging of vessels. The practice of placing a drop or two of croton-oil on the tongue is useful in many cases. If the comatose state continues for a considerable time, the patient must be supported by enemata; sinapisms may be applied to various parts; and the bladder must be attended to. If consciousness returns, the patient should be kept completely at rest, free from all mental disturbance, and upon low diet, until the period of danger from inflammation has passed. Should this morbid condition be set up, the hair may be cut short and cold applied, or small blisters to the nape of

the neck. The subsequent treatment of these cases, as well as those of *sudden hemiplegia* without coma, must depend upon their progress. The main indications are to support the general health, especially by proper diet, attention to hygienic conditions, and the administration of *tonics*; to avoid all forms of mental disturbance; and to treat symptoms, particularly paralysis, which must be managed according to the principles already pointed out. Iodide of potassium and bichloride of mercury have been supposed to aid in the absorption of a clot in the brain. A blister occasionally applied to the nape of the neck may prove serviceable.

CHAPTER LXIX.

CHRONIC DISEASES OF THE BRAIN AND ITS MEMBRANES.

I. CHRONIC MENINGITIS.

ÆTIOLOGY.—Chronic meningitis is chiefly met with as the result of former injury to the skull; prolonged mental labour, especially if combined with much anxiety; chronic alcoholism; and irritation by tumours and morbid deposits, especially syphilitic. In rare instances it remains after the acute form of the disease. One form of chronic meningitis, named *pachymeningitis*, most frequently comes on spontaneously in aged persons who are the subjects of imbecility or dementia. It is said to have been also observed in cases of chronic alcoholism and chronic phthisis. It is by far most common after middle age, and in males.

ANATOMICAL CHARACTERS.—The most frequent *post-mortem* signs of chronic meningitis are thickening and increased firmness of the membranes in different parts, sometimes extreme, with opacity of the arachnoid; adhesion of the membranes to each other, of the dura mater to the skull, or of the pia mater to the brain; increased vascularity, particularly of the pia mater, with permanent enlargement of many vessels; serous effusion into the meshes of the pia mater, there being also sometimes a considerable quantity of turbid fluid in the sub-arachnoid space; exudation, especially in the sulci and around the vessels, often surrounding and pressing upon some of the cranial nerves, and becoming organized and firm; and the presence of excess of clear or flocculent serum in the ventricles, the lining membrane of which becomes thickened and rough. Calcareous or osseous laminae may be formed in the thickened membranes, and the convolutions of the brain are sometimes atrophied. Increase in number and enlargement of the Pacchionian bodies has been considered a result of chronic meningitis.

The form of lesion named *pachymeningitis* usually begins in the region corresponding to the distribution of the middle meningeal

artery, and occupies a variable extent. A delicate adherent film forms, which mainly consists of large and thin-walled capillaries, partly of embryonic corpuscles. Gradually new films are developed upon this in succession, until they may attain a considerable thickness. The deeper layers at the same time become firmer, less vascular, and more fibrous. Extravasations of blood often occur, owing to rupture of the delicate vessels, usually small, and numerous, but not uncommonly considerable, so that the whole structure may look like a clot. Blood-pigment is frequently precipitated in crystalline and other forms.

SYMPTOMS.—These are often very obscure and ill-defined in chronic meningitis, being a combination of symptoms due to excited action and impaired function of the parts involved. The most important clinical indications of this disease are:—1. More or less constant general headache, of dull and heavy character, not severe or attended with exacerbations. 2. Persistent vertigo, the patient staggering while walking, as if drunk, but particularly on looking suddenly round over the shoulder. 3. Mental excitability at times, especially in the evenings, with peevishness, irritability, restlessness, and wakefulness; alternating with marked depression, the patient becoming apathetic, gloomy, low-spirited, and apprehensive. 4. In course of time failure of the intellectual faculties, sometimes ending in extreme dementia. 5. Subjective sensations of flashes of light, iridic colours, or tinnitus aurium; with at the same time diplopia or more or less impairment of sight in one eye, or partial deafness. 6. Hyperæsthesia of some part of the skin, with hypæsthesia or numbness of other portions. 7. Irregular twitchings or clonic spasms of various muscles, especially those of the face and eyeballs, causing grimaces and often external strabismus; also of the muscles of the limbs, which may present curious spasmodic movements from time to time, or be the seat of rigidity. 8. Irregular motor paralysis, usually incomplete, accompanying and following the above movements, affecting first the cranial nerves on one or both sides, as indicated by partial ptosis, drawing of the face to one side, strabismus or immobility of the eyeball, slight deviation of the tongue and thickness of speech; then extending to the limbs, in some cases only a few fingers or certain muscles being involved, in others the whole arm, one arm and leg, or sometimes all the limbs more or less. Irregular epileptiform attacks not uncommonly occur, but they are not attended with any special cry, or with stoppage of respiration and its consequences, while consciousness is not completely lost. The fit lasts an indefinite and often a considerable time, and is not followed by the comatose state observed in true epilepsy. In most cases some degree of pyrexia is noticed towards evening, with heat of head, flushing of the face, and conjunctival injection. Nausea and vomiting, with obstinate constipation, are not infrequent symptoms. Any excitement tends to increase the symptoms markedly. The ophthalmoscope often reveals optic neuritis or ischæmia.

In pachymeningitis the symptoms are very indefinite, being described as headache, vertigo, failure of the mental powers, gradually increasing hemiplegia, and occasional epileptiform or apoplectic attacks. Death usually occurs during one of these attacks.

II. CHRONIC CEREBRAL SOFTENING.

SYMPTOMS.—The pathology of this disease has been already considered, and it is only requisite to describe here the clinical history of softening, which is chronic from the commencement. The chief symptoms of this condition are:—1. Headache in many cases, persistent but not severe; usually of heavy character, and sometimes only amounting to a feeling of weight and heaviness; frontal as a rule, occasionally general, but never unilateral or localized. 2. Mental changes, viz., gradual failure of the intellectual faculties one after another, of which the patient is generally aware at first, which may ultimately end in complete dementia or mania; change in manner, disposition, and temper; various forms and degrees of aphasia, a tendency to repeat the same words several times and on all occasions being considered very characteristic; marked lowness of spirits; emotional disorder, the patient being either apathetic, or the emotions being but little under control, and quasi-hysterical fits of crying or laughing occurring without cause; sometimes a restless and excited manner at night, or even mild delirium. Occasionally the mind seems unaffected. 3. Sensory disorders, especially superficial and deep pains in various parts of the limbs, hyperæsthesia or dysæsthesia, formication, numbness, and gradual impairment of sensation, seldom amounting to complete anæsthesia; some degree of failure of sight and hearing, but rarely complete blindness or deafness. 4. Motor disturbance, in the direction of paralysis, incomplete in degree, and developed gradually and often in an intermittent manner, usually beginning in either arm or leg, but soon being more or less generally but irregularly distributed, though one side is as a rule more affected than the other, or sometimes confined to special groups of muscles, such as those of the face or part of a limb; frequently tonic rigidity, gradually increasing; tremors or clonic spasms, especially in the paralyzed muscles, with undue irritability on percussion; and sometimes epileptiform convulsions. The subjects of chronic softening commonly present an old or prematurely aged, unhealthy, and cachectic appearance. Degeneration of the vessels, weak heart, and granular kidneys are frequently well-marked. Usually the bowels are obstinately constipated. The duration of the disease is very variable. At last gradual coma sets in, usually with general paralysis and relaxation of the muscles, and involuntary passage of urine and feces. Speedy and unexpected death may happen from extensive thrombosis or from cerebral hæmorrhage.

III. ADVENTITIOUS GROWTHS IN CONNECTION WITH THE BRAIN AND ITS MEMBRANES—CEREBRAL TUMOUR.

ANATOMICAL CHARACTERS.—The chief adventitious growths or tumours which are met with in connection with the brain or its membranes include:—1. *Cancer*. 2. *Tubercle*. 3. *Syphilitic deposit*. 4. *Sarcoma*. 5. *Myxoma*. 6. *Glioma*. 7. *Cholesteatoma*. 8. *Lipoma*.

9. *Parasitic cysts*, viz., cysticercus cellulosus and hydatids. 10. *Cysts* containing fluid, fat, or hair; or presenting cauliflower excrescences. 11. *Aneurisms*. 12. *Vascular erectile tumours*. 13. *Osseous or calcareous masses*.

Cancer.—All forms of malignant disease are met with in the brain, but far most commonly the encephaloid variety, which usually occurs as a more or less round or lobulated tumour, of very variable size, generally single if primary, sometimes numerous if secondary. The growth may be inseparable from the brain-substance; distinctly defined; or surrounded by a cyst. The usual seat of cancer in the brain is the cerebral hemisphere, but it may occupy any part. It often shows signs of degenerative changes in its interior. It must be mentioned that cancer may originate from other structures within the cranium besides the brain itself, and then tends in some cases to make its way outwards; on the other hand, it may begin outside the skull and grow inwards.

Tubercle in the brain is described as forming irregularly-roundish masses, yellow and caseous-looking, dry and bloodless, sometimes continuous with the brain-substance through a greyish-white, somewhat translucent border, in other cases separated by a cyst. As a rule there is but one such mass, occasionally two, rarely more. The size generally varies from that of a hemp-seed to a cherry, but it may be equal to a small egg. Tubercle ordinarily occupies the cerebrum or cerebellum, rarely the pons. It often softens in the centre into a purulent-looking fluid, or an actual cavity may form.

Syphilitic disease.—Syphilitic deposit is far more commonly met with in connection with the membranes than in the brain itself. These are matted together, the dura mater being closely adherent to the skull at the seat of disease, and the inner membranes to the cerebral substance, while there is more or less thickening from the accumulation of a tough material, yellow in the centre, but usually presenting a greyish-white border around. This often involves some of the nerves. In the brain syphilis generally causes mere induration from interstitial proliferation of cellular tissue, especially at the surface. Gummata are extremely rare; they assume the form of irregular nodules or tumours, which may attain the size of an egg, their shape being often modified by the part of the brain in which they occur, and they always pass gradually into the surrounding tissue, either through a greyish softer material or an indurated infiltration. A section is yellowish-grey or yellowish, and translucent; cheesy or gluey in consistence; and it often presents signs of decay, in the form of opaque spots scattered over the entire surface, but there is no central softening, such as is observed in tubercle. The more vascular parts of the brain are the usual seats of syphilitic gummata. Generally only a single deposit is found.

Sarcoma.—This form of tumour is not uncommon, and may be connected with the membranes, or imbedded in the brain-substance, especially the cerebrum. It is round or lobulated, varying in size from a nut to a good-sized apple, being distinctly defined and frequently enclosed in a vascular capsule, from which it can be turned out. A section is smooth, and dirty-white or greyish-red; and the consistence is generally soft, but may be firm and fibrous. In structure a sarcoma

consists mainly of spindle-shaped cells. Calcification may take place in spots; or spaces may be formed, containing fluid:

Myxoma.—Usually occurring as a distinct tumour of variable size, occasionally as an infiltration, myxoma is generally observed in the cerebrum. It is very soft, and may be almost gelatinous; somewhat translucent; and has usually a yellowish or reddish colour, but may present extravasations of blood. In structure the material consists of variously-formed cells, imbedded in a homogeneous hyaline substance.

Glioma.—Resulting from a local hyperplasia of the neuroglia, this form of growth is never well-defined, but runs into the surrounding brain-substance, and does not pass from the brain to the meninges. It is usually found in a cerebral hemisphere, and may attain a considerable size. The colour of a section varies from yellow to greyish-red, and cut vessels are generally seen. The consistence is usually rather soft. Glioma consists of a finely-reticulated material enclosing roundish nuclei. It may become the seat of degeneration or hæmorrhage. It occurs chiefly in young persons.

Cholesteatoma is a very rare growth, consisting of concentric laminae of epithelial-cells. It forms a tumour, surrounded by a delicate membrane, and presenting a pearly lustre on section. It may develop from the brain, the meninges, or the skull.

Cysticerci are generally found in the grey substance, being usually numerous when present. **Echinococci** are very rare.

Aneurism is also a rare condition in connection with the brain. It generally affects one of the arteries at the base, being in most cases of small size, but may attain the dimensions of an egg.

The other forms of cerebral tumour do not call for any special description.

SYMPTOMS.—There is no disease of the brain in which the symptoms are more diverse in their characters and course than in the different kinds of tumour, so much depending on their situation, size, shape, number, and rapidity of growth. Further, the symptoms are not only due to the mechanical effects of the tumour, but those of cerebral softening, hydrocephalus, and chronic meningitis are often superadded after a time.

Occasionally a tumour, even of considerable size, is quite latent throughout; or a sudden apoplectic attack, the result of congestion or hæmorrhage, reveals its existence. The characteristic clinical features of a cerebral tumour, however, are as follows:—1. Headache, at first slight, but by degrees becoming very severe; often localized, though not necessarily over the seat of the tumour; constant, and of dull grinding character, but subject to violent exacerbations, which may be accompanied with obstinate cerebral vomiting, the pain being often increased by any excitement, coughing, sneezing, a deep breath, or strong light. 2. Marked vertigo, or a peculiar dizziness on movement in some cases. 3. Absence of any mental disturbance in uncomplicated cases, unless a tumour is very large or rapid in its growth, or there should be several growths scattered through the cortical substance. 4. Signs of irritation followed by gradual paralysis of such of the cranial nerves as the growth implicates, these being generally unilateral. Vision is often affected, terminating in complete blindness, and it is not

uncommon for one eye to be involved after the other. Smell and hearing may also be impaired or lost, the latter usually on one side. Severe neuralgic pains, hyperæsthesia, and paræsthesiæ frequently affect the fifth nerve, followed by gradual loss of sensation to complete anæsthesia, and paralysis of its motor portion occasionally. The facial nerve is most commonly implicated, next the third and sixth, and sometimes the fourth, there being first twitchings and spasmodic movements, followed by paralysis of the muscles supplied by these nerves; when the paralysis is complete, electric irritability becomes usually quite extinct. Partial paralysis of the eighth and ninth nerves is not uncommon, causing impairment of speech and deglutition, or sometimes disturbance of respiration or cardiac action. 5. Disorders of sensation and motion in the limbs. These are, if present, as a rule of more or less unilateral distribution, and are observed on the side opposite to that on which the cranial nerves are implicated. Rarely these disorders are bilateral, or they may be very limited. At the outset signs of irritation are observed, followed by gradually progressive paralysis, which is accompanied with spasmodic movements or rigidity. Electric irritability is not lost in the limbs. When a tumour occupies the interior of one cerebral hemisphere, there may be pure hemiplegia. Epileptiform convulsions are not uncommon, the convulsive movements being frequently localized mainly in some particular part. When a tumour occupies certain portions of the brain, peculiar rotatory and other movements are observed. A special feature in tumours of the cerebellum, more especially of the middle lobe, is said to be a tonic rigidity of the muscles of the back of the neck, with retraction of the head, associated frequently with flexion of the fore-arms and extension of the legs, with pointing of the toes. They also press on the *venæ Galeni*, and cause dropsy of the ventricles, with corresponding mental symptoms. The important ophthalmoscopic signs of cerebral tumour are those of ischæmia; descending neuritis; or atrophy of the disc. Occasionally a tumour becomes evident externally. In cases of aneurism, it is said that a murmur has been occasionally heard over some part of the skull. The general condition of the patient varies much. The constitution is gravely affected, should there be much suffering, with loss of sleep. Sometimes considerable emaciation and marasmus, or evidences of some cachexia are observed; or cancerous, syphilitic, or tubercular deposits may be discovered in other parts. The mode in which cases of cerebral tumour terminate is very variable. In those which have come under my observation the end was always unexpected, acute symptoms setting in without any obvious cause.

IV. CHRONIC HYDROCEPHALUS.

ÆTIOLOGY AND PATHOLOGY.—Chronic hydrocephalus is characterized by accumulation of fluid, either in the ventricles; in and beneath the arachnoid; or in both these situations. In the great majority of cases the condition is either congenital, or is revealed within six months after birth, and has then been chiefly attributed to arrest of development of the brain, or to chronic inflammation of the ventricular lining mem-

brane. It may come on as an acquired complaint, however, in older children, or very rarely even in adults, being then the result of closure of the *venæ Galeni*, usually the consequence of pressure by a tumour. Chronic hydrocephalus has no connection with tubercle, but is not uncommon in cases of rickets. Excess of fluid may accumulate in the arachnoid sac in connection with senile or other forms of atrophy of the brain; or after previous hæmorrhage.

ANATOMICAL CHARACTERS.—The quantity of fluid in cases of chronic hydrocephalus varies from a few ounces to several pints. It is usually watery, limpid, and colourless; of low specific gravity; and contains but a very small quantity of albumen, with some saline matter. The ventricular lining membrane is often altered in appearance, thickened, granular, and rough. The arachnoid is stretched, and signs of chronic meningitis are often observed about the base. The brain is altered in shape, sometimes unsymmetrical, its convolutions being flattened and spread out; and its texture is in many cases firmer than natural, or, on the other hand, soft and macerated. The optic nerves are usually much stretched. The cranial bones are frequently expanded and thinned, the fontanelles and sutures being considerably widened; sometimes the bones are thickened, but spongy.

SYMPTOMS.—Only the signs of chronic hydrocephalus in children need be considered here. The head enlarges, in some cases attaining an enormous size, so that it falls from side to side if not supported, and at the same time assumes a curious shape, becoming round and globe-like, with a very large and prominent forehead, the bones being driven apart, while the orbital plates of the frontal are pushed down, especially behind, the eyeballs being thus pressed forwards so as to become very prominent and to look downwards. The fontanelles and sutures are widened to a variable degree, as well as prominent; while frequently distinct fluctuation can be detected. The scalp feels thin, sometimes almost as if it were going to give way, and the bones may be so attenuated as to yield a crackling sensation. The lower part of the face looks very small, and has a curious worn or stupid expression. It may present a puffy appearance, with enlarged vessels on the cheeks. The nervous symptoms which are liable to be met with are headache, though this is often absent; vertigo; non-development, or gradual failure of the mental faculties, even to complete imbecility; disturbed sleep at night, with drowsiness by day; marked peevishness, irritability, or depression of spirits; failure of the special senses, especially that of sight, with signs of ischæmia or atrophy of the disc; restlessness, with general muscular weakness and loss of co-ordinating power, tottering gait, tremors of the limbs, spasmodic movements or convulsions coming on without any obvious cause, strabismus, or laryngismus stridulus. The body is generally much wasted; circulation is feeble; and the child always feels cold. Excessive appetite, vomiting, and constipation with unhealthy stools are common symptoms. The duration of cases of chronic hydrocephalus is variable, but usually death occurs within the first few years of life, chiefly from gradual or sudden coma, exhaustion, convulsions, or laryngismus stridulus.

V. HYPERTROPHY OF THE BRAIN.

Only a few remarks are required with reference to the so-called *hypertrophy* of the brain observed in children. This is associated either with rickets or with congenital syphilis; and the increase in size and weight of the organ is probably due either to albuminoid infiltration of the white substance, or to increase in the neuroglia. The tissue becomes unusually firm, pale, and dry; the convolutions being compressed, flattened, and closely packed. The head expands, but the enlargement is distinguished from that of chronic hydrocephalus by being much less rapid in its progress, never attaining any great size, and by having an elongated form from before back; while the fontanelles and sutures are not at all or but little apart, the former being often depressed, and not yielding fluctuation; and the eyes are sunken. Frequently there are no evident nervous symptoms, but if the head is closed before the brain enlarges, serious symptoms are liable to arise, such as severe headache, vertigo, mental failure, epileptiform attacks, paralysis, or coma.

VI. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. DIAGNOSIS.—The principal chronic cerebral diseases between which a diagnosis has usually to be made are *chronic meningitis*; *chronic softening*; and *cerebral tumour*. It must be remembered that these are often associated, under which circumstances their symptoms are more or less combined. The chief points to be considered in the diagnosis are:—1. The *history* of the case, as revealing some local cause of meningitis or a syphilitic taint; or the absence of any such cause. 2. The *age* and *general condition* of the patient, with the state of the main organs and vessels, softening being generally accompanied with signs of marked degeneration, and occurring in old persons or in those prematurely aged. There may be signs of some constitutional taint associated with a cerebral tumour; or of morbid deposits in other parts, especially cancerous, tubercular, or syphilitic. 3. The seat, intensity, and characters of *headache*. 4. The *mental condition*, meningitis being chiefly characterized by excitement alternating with depression; softening by gradual and permanent impairment of the mental faculties; while in cases of tumour the mind is often quite unaffected. 5. The character and mode of distribution of *sensory* and *motor* disturbances. These have been already pointed out in the description of the symptoms of each disease, and they are very important. 6. The appearances revealed by the *ophthalmoscope*. Occasionally external objective signs of tumour are observed. As to the *nature* of a growth in the brain, it is often impossible to come to any certain conclusion. Some indications may be derived from the age of the patient; a history of syphilis; signs of a particular cachexia; or the presence of morbid growths in other parts.

Epileptiform seizures may occur in the course of the diseases just considered. These can generally be distinguished from true epileptic

fits by their irregular character ; and by the existence of definite symptoms indicative of one or other of these morbid states.

The differences between *chronic hydrocephalus* and *hypertrophy of the brain* in children, each of which causes enlargement of the head, have been sufficiently pointed out in their several descriptions.

2. PROGNOSIS.—In chronic brain-affections the prognosis is very uncertain. All that can be definitely stated is that any such affection is always serious ; and that at any moment dangerous symptoms are liable to arise, which may end in speedy death. If the disease is of a syphilitic nature, however, much improvement may often be effected by proper treatment. If there are indications of frequent or constant disorder of the cerebral circulation, along with degeneration of the vessels, the danger of the supervention of hæmorrhage or thrombosis should be recognized.

3. TREATMENT.—The principles of treatment applicable to chronic cerebral diseases are very simple, viz. :—*a.* To keep the mind free from every possible excitement or anxiety, and to forbid any mental labour ; in short, to keep the brain as much at rest as possible. *b.* To support the general health by good food, fresh air, quinine, iron, cod-liver oil, and hypophosphites. *c.* To aid absorption of morbid products. Iodide of potassium, bichloride of mercury, and grey powder are the chief drugs employed in cases of chronic meningitis, but they are especially important in syphilitic disease. Occasional blistering is supposed to promote absorption. *d.* To treat symptoms, especially headache ; paralysis ; restlessness and sleeplessness, by means of hyoscyamus, cannabis indica, or chloral ; and convulsive seizures by bromide of potassium. Acute symptoms may arise calling for active interference. For chronic hydrocephalus *diuretics* are recommended, with the view of aiding absorption of the fluid. Pressure around the head by means of a bandage or strapping ; and removal of the fluid by the aid of a fine trochar or the aspirateur, have also been employed as methods of treatment in this condition.

CHAPTER LXX.

DISEASES OF THE SPINAL CORD.

I. ACUTE SPINAL MENINGITIS.

ÆTIOLOGY.—The causes of this disease are :—1. Traumatic injury. 2. Caries of the vertebræ. 3. Sacral bed-sores penetrating deeply, and opening the spinal canal by destroying the sacro-coccygeal ligament. 4. Exposure to cold and wet, especially local ; to sudden changes of temperature ; or to powerful direct heat over the spine. 5. Acute rheumatism very rarely. 6. Adventitious deposits and tumours, especially syphilitic growths and tubercle. 7. Tetanus,

chorea, or hydrophobia, it is said. 8. Epidemic cerebro-spinal meningitis. 9. Extension from cerebral meningitis.

ANATOMICAL CHARACTERS.—The *post-mortem* appearances resemble more or less those of cerebral meningitis. Usually the membranes are extensively affected, the pia mater being very vascular, infiltrated, and thickened. A soft exudation often covers its surface, as well as that of the arachnoid; while fluid occupies the sub-arachnoid space, either turbid and flocculent, or more or less puriform in appearance. This may be so abundant as to distend the dura mater considerably. The latter is frequently reddened, and exudation or pus may accumulate between it and the bones, or it may exhibit signs of local injury or irritation. These conditions are especially seen in connection with caries of the vertebræ, or sacral bed-sores. The pus in the arachnoid cavity may be fœtid, dirty-looking, and greenish.

SYMPTOMS.—Acute spinal meningitis is characterized at the outset by signs of irritation of the roots of the spinal nerves; followed by those of paralysis. The disease often sets in insidiously, and at first may be mistaken for rheumatism. The early symptoms are severe paroxysms of pain felt along the spine, but only coming on when the patient moves; tenderness on deep pressure, though not very marked as a rule; pains shooting from the spine into the limbs and trunk, but especially into the legs, though sometimes they may be chiefly felt in the arms, or even in one arm if the inflammation is limited; some degree of hyperæsthesia; contraction of the muscles of the neck and back, which may cause opisthotonos, usually regarded as being due to tetanic spasm, but also considered as an instinctive act to avoid pain; fits of painful spasm in the limbs, neck, and back, with involuntary startings and jerks, but not the powerful spasms observed in tetanus; some embarrassment of breathing, which is considerable if the respiratory muscles are affected with spasm, being then attended with a sense of oppression and suffocation; occasionally some difficulty of mastication and deglutition; and irritability of the bladder. The attack may be ushered in with a chill or rigors, followed by slight pyrexia with its accompanying symptoms. The patient is usually very restless, anxious, and sleepless, but there are no prominent head-symptoms. Afterwards tingling, formication, and numbness are not uncommonly complained of; while muscular weakness is observed, beginning below and extending upwards; with partial loss of control over the bladder and rectum, involuntary discharge of urine and feces consequently taking place. Priapism is rarely observed. In fatal cases death may result from asphyxia or asthenia; from implication of the cerebral membranes; or from the cord being compressed by inflammatory products, or becoming itself inflamed.

II. CHRONIC SPINAL MENINGITIS.

But little is definitely known about this morbid condition. It is chiefly met with in connection with bone-disease, and adventitious growths, especially syphilitic. Anatomically it may be revealed by thickening, induration, and roughness of the membranes; remnants of

old inflammatory products; adhesions or bands passing across the sub-arachnoid space; and sometimes calcareous deposits. Syphilitic growths present characters like those exhibited by similar deposits in the cerebral membranes. Pachymeningitis may be met with in connection with the spinal cord, usually near the cervical enlargement. The layers are developed on the inner aspect of the dura mater, and differ from those in the cerebral dura mater by being from the first dense and tough, but slightly vascular, and therefore not inclined to bleed. The pia mater is apt to become involved, and the cord and nerves become pressed upon.

SYMPTOMS.—The symptoms of chronic spinal meningitis are described as slight pain over some part of the spine; severe pains in the limbs, of a rheumatic character; paræsthesiæ in the legs, with gradually increasing hypæsthesia, but not complete anæsthesia; slight spasmodic movements in the limbs, followed by paralysis, beginning in the lower extremities and gradually extending upwards to the trunk, bladder, rectum, or even to the arms, the paralysis being at first slight, increasing very slowly, and being persistent but subject to marked variations in its course. Ultimately all the signs indicative of destruction of the cord are developed.

In the early period the symptoms of cervical pachymeningitis are said to be acute pains at the back of the neck, shooting to the head and arms, constant, but liable to exacerbations; rigidity of the muscles, especially of those of the neck, which is kept fixed; formication and a feeling of weight in the limbs; more or less muscular weakness; and not uncommonly bullous eruptions. Subsequently the pains in the limbs cease; while the muscles of the arms become paralyzed and waste, especially those of the forearm, which are supplied by the musculospinal and median nerves, and more particularly the latter, so that a "claw-hand" is developed. The arms then become contracted; and patches of anæsthesia appear on them and on the upper part of the trunk. Ultimately the legs become paralyzed and contracted, but do not waste.

III. ACUTE MYELITIS—INFLAMMATION OF THE CORD.

ÆTIOLOGY.—Acute myelitis may result from caries of the spine; injuries, including also severe strain and concussion; irritation by adventitious growths or clots; cold; or direct exposure of the spine to powerful heat. The disease has also been attributed to suppression of perspiration or of chronic discharges; the sudden cure of a chronic skin-disease; or sexual excess.

ANATOMICAL CHARACTERS.—Inflammation of the spinal cord, when primary, usually begins in the central grey matter, and may either extend along this from one end to the other, or be confined to one or more portions of the cord, spreading throughout its entire thickness, especially opposite the lumbar enlargement. If it follows meningitis, the white substance is first involved, and the central grey matter is not implicated for some time. The affected tissue is generally much softened, being often of cream-like consistence; more or less reddened

at first, but afterwards it may become yellowish; swollen and relaxed, the entire cord sometimes presenting a distended appearance, or being nodulated on the surface, and the central grey matter having lost its contour. Extravasations of blood are liable to occur, and Charcot believes that hæmorrhage into the substance of the cord is generally, if not always, the result of previous inflammatory softening. Very rarely abscesses form. The microscope reveals broken-down nerve-elements, granules, blood-cells, and granular or pus-corpuscles. There is always more or less spinal meningitis. A form of acute myelitis is described in which the cord becomes indurated, owing to fibrinous exudation. This has been considered by some pathologists as always preceding softening; by others, probably more correctly, as being the result of a less acute process.

SYMPTOMS.—Primary myelitis is characterized by the absence of the signs of irritation of the nerves observed in meningitis; with the rapid development of those indicative of destruction of the cord. The disease may set in gradually, or with remarkably acute or even sudden intensity. Its special symptoms are described as slight pain over the spine, usually circumscribed, not increased by movement or moderate pressure, but intensified by kneading, and especially by applying a hot sponge or ice, which produces a burning sensation at the upper limit of the inflammation; a feeling of constriction around some part of the trunk, as if it were bound by a tight cord; marked paræsthesiæ in the limbs and trunk, but especially in the legs, such as tingling, formication, furriness, numbness, or subjective coldness, speedily followed by hypæsthesia or anæsthesia, more especially in the legs, but sometimes more extensively distributed; marked restlessness, followed rapidly by muscular paralysis below the seat of inflammation, therefore usually paraplegic in its distribution; loss of power over the bladder and rectum, not uncommonly accompanied with great irritability, the patient desiring to have the catheter passed very frequently; and constant priapism. In the paralyzed parts electric sensibility and contractility are usually impaired or lost; so as a rule is reflex excitability, but should the portion of the cord below the seat of inflammation be healthy, this is exaggerated. In consequence of the extensive destruction of the grey matter, the trophic lesions already described as being associated with spinal diseases are very liable to arise, namely, rapid wasting of muscles, the formation of acute bed-sores, and inflammation of the bladder and kidneys. When the myelitis extends high up, respiration is more or less impeded, the voice is weak, and there may be dysphagia or difficulty of speech. This disease gives rise to little or no fever. The disease generally soon terminates fatally, usually from asthenia or apnœa; or may pass into a more or less chronic condition. The extent of the symptoms will depend upon the height of the disease in the cord; and occasionally the inflammation is confined to one-half or to certain tracts of the cord, the symptoms being limited accordingly.

IV. CHRONIC MYELITIS—WHITE SOFTENING.

ÆTIOLOGY AND PATHOLOGY.—Softening of the spinal cord may have its origin either in acute or chronic myelitis ; in gradual pressure upon its substance ; in injury ; or in failure of nutrition from degeneration of its vessels. The softened cord is quite white in the degenerative form, or it may present a more or less red or yellowish colour. Abundant granular corpuscles and granules are visible under the microscope.

SYMPTOMS.—If the cord becomes gradually diseased, the signs of the change are more or less of the following character :—Dull pain or uneasiness over some portion of the spine, increased by pressure, percussion, or the application of a hot sponge or cold, but not by movement ; a feeling of tightness round the body ; distressing paræsthesiæ, wandering pains, or fidgety sensations in the legs, followed by gradual loss of feeling to complete anæsthesia, this often extending up the body to a variable extent ; twitchings, spasmodic movements, and cramps in the legs, with diminished power, dragging of the legs in walking, and a sense of heaviness and fatigue, ending in paraplegia ; frequently a marked tendency to painful contractions and rigidity in the paralyzed limbs, the legs being in many cases drawn up involuntarily if left to themselves, sometimes by jerks, so that the joints become strongly flexed, or one or both limbs being rigidly extended ; increased reflex and electric irritability in the paralyzed limbs, provided the disease has not extended down to the roots of the nerves, but if these are involved the irritability is impaired or lost ; rapid tendency to wasting of the muscles of the legs, with failure of circulation and nutrition, the skin being often covered copiously with dried epithelium-scales, and bed-sores being very liable to form ; paralysis of the bladder, leading to retention and decomposition of urine, and consequent cystitis ; paralysis of the rectum, with unconsciousness of the passage of stools ; gradual loss of sexual power and inclination, though there is often reflex priapism. In rare instances the cord may become so extensively diseased as to give rise to general paralysis, with marked wasting of the muscles, and loss of electric irritability.

V. SPINAL CONGESTION.

This condition is supposed to be characterized by the sudden onset of incomplete spinal symptoms, which afterwards disappear, but are liable to recur, viz. :—some degree of dull aching along the spine, increased by heat, but not by movement or pressure ; aching pains in the limbs, with variable paræsthesiæ, such as tingling in the toes and fingers, numbness, or sometimes hyperæsthesia, but no anæsthesia ; twitchings in the limbs, with partial loss of power in the legs or sometimes in the arms, often unequal on the two sides, there being no evident alteration in reflex irritability or in electric irritability or sensibility, or any tendency to wasting or other signs of impaired nutrition. The bladder and rectum are not involved. Slight motor and sensory disturbances in the limbs accompany persistent mechanical congestion of the cord, such as that which results from chronic heart disease.

VI. SPINAL HÆMORRHAGE.

Blood may escape into the cord itself ; between the membranes ; or outside the dura mater. Injury is by far the most frequent cause of spinal hæmorrhage, but occasionally a vessel gives way spontaneously. When it takes place into the cord, this is generally due to previous softening from inflammation.

SYMPTOMS.—1. *Into the spinal cord.*—This is evidenced by sudden acute pain in the back, with signs of severe shock to the system, the patient being often unconscious for the time ; complete and permanent paralysis of motion and sensation in the legs, or more extensively, according to the seat of mischief ; paralysis of the bladder and rectum ; and priapism. These conditions are usually permanent. 2. *In connection with the membranes.*—If the hæmorrhage is abundant, the symptoms are as above ; but usually indications of sudden severe irritation are first observed, in the way of painful sensations shooting from the spine, hyperæsthesia, painful spasmodic movements in the limbs, opisthotonos, or even strong convulsive movements, followed by paralytic symptoms.

VII. ADVENTITIOUS GROWTHS IN THE CORD.

Various tumours have been found in connection with the spinal cord, but *cancer*, *syphilitic deposit*, and *tubercle* are the most important. The usual symptoms include localized pain in the back, especially in connection with cancer ; neuralgic pains shooting from this point into the limbs or trunk, due to irritation of the nerves, with paræsthesiæ, followed by anæsthesia if the cord becomes destroyed ; muscular disturbance succeeded by paralysis, in some cases beginning on one side and extending gradually to the other. Objective evidences of a tumour might be discovered on examination of the spinal region. If the growth is in the cord itself, there will only be gradual loss of its functions up to the level of the part involved. In the case of syphilitic disease, the symptoms often improve greatly or entirely disappear under appropriate treatment, owing to absorption of the deposit. Signs of some cachexia may be present ; or there may be indications of morbid growths in other parts.

VIII. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. **DIAGNOSIS.**—The diagnosis of spinal affections needs but brief notice. *Acute spinal meningitis* may be mistaken for tetanus ; for spinal congestion ; or for spinal irritation ; but there is rarely any difficulty in making a diagnosis between them. *Myelitis* is distinguished from meningitis by the absence of symptoms of irritation ; with rapid development of signs of destruction of the cord, and failure of its functions. *Chronic affections of the cord* may be simulated by *hysterical* or *reflex paraplegia*. The characters of the former have been already pointed out. In *reflex paraplegia* some cause can be

discovered; the paralysis is in proportion to the intensity of this cause, and is generally partial and incomplete; there is no wasting of muscles; sensibility is usually normal; and the bladder and rectum are but little or not at all affected. The paralysis disappears if the cause is removed. *Chronic softening* of the cord is as a rule easily recognized by the local sensations; and the permanent paralytic and other symptoms. *Syphilis* is a most important cause of spinal disease, and where there is a history of a syphilitic taint, treatment directed against this condition should always be had recourse to, when the symptoms, if due to syphilitic deposit, are either greatly ameliorated or entirely got rid of. The signs of other adventitious growths, spinal hæmorrhage, and the more rare morbid conditions affecting the spinal cord have been sufficiently indicated in the descriptions already given.

2. PROGNOSIS.—*Acute inflammation* of the cord or its membranes is very grave, and often proves rapidly fatal, but myelitis may remain as a chronic affection. Once the cord is destroyed by an acute or chronic lesion, permanent paralysis is established in the parts below the seat of mischief, but cases of this kind frequently linger on for a long while, and the patients may enjoy good general health. Bed-sores, cystitis, and other untoward complications are, however, very liable to arise. Symptoms due to syphilitic disease of the cord often improve remarkably under appropriate treatment.

3. TREATMENT.—In treating *acute inflammation* affecting the spinal cord or its membranes the patient should be kept at rest, lying on the side or in a somewhat prone position. Ice may be applied constantly along the spine. In some cases the application of leeches over this region is useful. Medicines are of doubtful value. Dr. Radcliffe recommends iodide of potassium with opium in the treatment of spinal meningitis. When the cord is involved, belladonna, conium, and ergot are believed to exercise a direct beneficial effect upon it. It is particularly important to attend to the bladder and bowels in cases of disease of the cord; to see that the patient is kept clean and dry; and to guard against bed-sores, for which object a water-bed or air-bed is very valuable. This applies more particularly to *chronic* affections, in which all that can be done further is to support the general health by good food, proper hygienic conditions, and the use of *tonics*, especially quinine, iron, and preparations of phosphorus; to promote absorption of morbid products, particularly syphilitic deposits, by the aid of iodide of potassium and bichloride of mercury; to stimulate the functions of the cord by minute doses of strychnia; and to treat paralysis or other symptoms. Tincture of cantharides is also employed in the treatment of diseases of the cord.

CHAPTER LXXI.

SCLEROSIS OF THE NERVE-CENTRES.

OF late years the morbid condition named *sclerosis*, which involves the nerve-centres, has attracted considerable attention. It affects different parts of these centres in different cases, but the subject can be most conveniently discussed in a comprehensive article, first considering the lesion from a general point of view, as regards its ætiology, pathology, and anatomical characters; and then discussing the variations in the clinical history presented in different cases according to the distribution of the sclerosis in the nerve-centres. There are certain diseases believed by some authorities to be of this nature, but the pathology of which is at present disputed, so that they will not be considered here. Different writers have adopted different arrangements of the affections resulting from sclerosis, but the following classification includes the chief varieties which have been recognized, and is sufficient for all practical purposes:—I. DIFFUSED CEREBRAL SCLEROSIS (Hammond). II. SPINAL SCLEROSIS, including (1) **Locomotor ataxy**; (2) **Lateral sclerosis of the cord**. III. DISSEMINATED OR MULTIPLE SCLEROSIS. IV. GLOSSO-LABIO-LARYNGEAL PARALYSIS.

ÆTIOLOGY.—Age seems to have considerable influence as a *predisposing cause* of the various forms of sclerosis. The diffused cerebral form is said to begin during infancy. The spinal varieties occur chiefly from 25 to 45 or 50 years of age; while the disseminated form usually comes on between 20 and 25, seldom after 30, sometimes at the time of puberty. Males suffer in larger proportion than females on the whole; but some forms of the disease, namely, idiopathic lateral sclerosis, multiple sclerosis, and glosso-labio-laryngeal paralysis, seem to be more common in females. Hereditary predisposition is traceable in some cases, and if not to the actual disease, it may be to some other form of nervous disorder; locomotor ataxy occasionally runs distinctly in families. The *exciting causes* of sclerosis are very obscure, and in many cases cannot be made out in the least. When of cerebral origin, it has been attributed in different instances to hæmorrhagic cysts; injury to the head; acute fevers, especially typhoid and scarlatina; rheumatism or syphilis; dissipation; severe emotional disturbance; excessive mental application; or great muscular exertion. The spinal varieties have been supposed to be the result of previous inflammation of the cord or its membranes; injuries to the spine, or shock; over-exertion and straining; the constant maintenance of a bent position; sexual excess; exposure to cold and wet; gout, scrofula, or syphilis; or abuse of alcohol. Lateral sclerosis of the cord is a not uncommon result of cerebral hæmorrhage or other lesion in the brain, the disease extending downwards along certain tracts. It may be idiopathic in its origin.

ANATOMICAL CHARACTERS.—Sclerosis consists essentially of hyperplasia of the neuroglia, with coincident atrophy and degeneration of the nerve-elements, which may ultimately lead to their complete disappearance. The process is looked upon by most pathologists as being of an

inflammatory nature. Charcot maintains that in some instances the inflammation begins in the nerve-cells. The more obvious changes indicative of the sclerotic change are a greyish, semi-translucent appearance of the affected part ; various degrees of increased firmness and induration, ultimately ending in marked hardness and toughness ; and at first some tumefaction, but soon passing into contraction and condensation, with consequent diminished bulk and shrinking. The colour may finally become greyish-white or yellowish-grey. Usually firm adhesions form with the corresponding pia mater, which also undergoes analogous changes.

As regards the minute changes in sclerosis, as observed with the microscope, in the early period embryonic cells appear in the neuroglia and peri-vascular spaces, along with more or less increase of the amorphous intercellular substance in the neuroglia. Subsequently contraction and induration take place, the cells become small and indistinct, the intercellular substance becomes delicately fibrillated, and the walls of the vessels are thickened, with consequent narrowing of their channels. At first the nerve-elements present little, if any change. Later on, if sclerosis involves the white substance, the nerve-fibres become more or less separated from each other, most of them diminish in size, though some may be normal or even enlarged, and they may present a moniliform appearance. Finally they become greatly atrophied, on account of the loss of their medullary sheath, but they are rarely entirely destroyed. In the grey matter the nerve-cells are also involved. In some cases Charcot describes in the early period changes due to irritation, in which the nerve-cells become swollen, sometimes being enormously enlarged, finally granular, and opalescent ; their processes at the same time appearing more or less thickened and twisted. Usually atrophic changes take place. The cells may merely shrink in all directions and dry up ; or sometimes a deposit of pigment occurs in them, while they diminish in size, assume a more or less globular shape, their processes become shortened and attenuated, and at last they only form minute roundish collections of pigment, or even disappear altogether. Lockhart Clarke has described irregular disintegrated patches as being occasionally observed in sclerotic tracts, from which all traces of the different tissues and blood-vessels have disappeared.

Having thus discussed the general nature of sclerosis, the several varieties of the disease according to its distribution may now be considered. It may be previously remarked, however, that the lesion shows a peculiar tendency in different cases to be confined to certain tracts or regions, rarely passing beyond the limits of these portions of the nerve-centres. Moreover, the ultimate effect of the morbid process is seriously to impair, or even completely to abolish the functions of the parts involved, though during its progress signs of irritation may be evident.

I. DIFFUSED CEREBRAL SCLEROSIS.

Dr. Hammond describes this form, in which a large portion or the whole of a lobe is involved, or sometimes even the entire hemisphere,

and the lesion is not circumscribed. It becomes less marked at its circumference, and never invades the grey substance of the brain.

SYMPTOMS.—In this variety the mental faculties either remain undeveloped to a variable degree, or become impaired if the disease sets in later in life. The patient never learns to talk, or speech becomes imperfect or lost after it has been acquired. Usually more or less hemiplegia is observed, with arrest of growth, contractions, and distortions of the affected limbs, in which sensation may also be impaired. One or more of the special senses are usually enfeebled or lost. Many of the patients suffering from this complaint belong to the class of idiots or imbeciles, whose habits are filthy, and who pass their excretions involuntarily. Frequent attacks of epileptiform convulsions are not uncommon during the progress of the lesion, with signs of cerebral irritation at an early period. The progress is very chronic, and patients often live to an advanced age.

II. LOCOMOTOR ATAXY—TABES DORSALIS.

This is one of the forms of sclerosis best known and most commonly met with. The disease involves the posterior columns of the spinal cord, as a rule equally, and often throughout their whole horizontal area, the changes being most marked below, and progressively diminishing upwards. Charcot has shown that the tracts which are concerned in producing the symptoms of locomotor ataxy are two narrow bands of white matter, lying on each side between the inner and posterior aspect of the posterior cornu and nerve-roots on the one hand, and the posterior pyramid on the other; in some cases these pyramids are quite healthy, but generally they become involved. Moreover, in most cases the internal radicular fibres of the posterior roots of the nerves, and the adjoining parts of the posterior cornua, become more or less implicated. In exceptional cases the disease spreads to the lateral columns, or even to the anterior cornua; but, according to Charcot, this extension takes place along the internal radicular fasciculi, and not through the intermediate tissues. The morbid change may advance gradually up to the brain.

SYMPTOMS.—Locomotor ataxy in the large majority of cases comes on insidiously, and runs a very chronic course. In exceptional instances its characteristic symptoms are developed suddenly or rapidly. Certain so-called *premonitory* symptoms are usually observed, which may last for months or years, but these are really the early symptoms of the disease. They may be summed up as:—1. *Sensory derangements* in the legs and lower part of the body, viz., an unusual feeling of fatigue after slight exertion; painful sensations in various parts of the limbs and about the joints from time to time, supposed to be rheumatic; and also extremely severe neuralgic pains, coming on suddenly and being of momentary duration, described as darting, boring, cutting, throbbing, or like an electric shock; sometimes constrictive pains, affecting the trunk or occasionally the limbs; hyperæsthesia, dysæsthesia, or paræsthesiæ of the skin. 2. *Internal pains*, referred to the bladder, urethra, or rectum; or, more particularly, extremely severe attacks of gastralgia,

the pains shooting to the back, around the abdomen, and in other directions, and being accompanied with vomiting, faintness, deranged cardiac action, and a feeling of marked illness. 3. *Paralysis of sensory or motor nerves*, sometimes temporary or recurrent, sometimes permanent. 4. *Disorders of vision and hearing*, and objective changes in connection with the *eyes*, such as dimness of vision at times, or even complete amaurosis; diplopia; contraction of the field of vision; slight strabismus or ptosis; atrophy of the disc or chronic neuritis. Extreme contraction of the pupils is a marked feature, and the pupils may be unequal. Deafness is not uncommon. 5. *Sexual disturbance*. It is said that sexual desire is usually increased at first. Trousseau observed that there is in the early period a peculiar aptitude for repeating sexual intercourse a great many times within a short period. Soon, however, sexual power and desire become gradually lost. Spermatorrhœa is frequently complained of. 6. *Difficulty in retaining the urine* in some cases, the patient being obliged to obey the call to urinate instantly; or, on the other hand, retention and inability to pass water.

When the disease is fully declared, the symptoms are very characteristic, and chiefly point to a loss of the power of co-ordination in the muscles of the legs, and of the muscular sense. At first the patient feels that he is losing control over the movements of his legs, and that he cannot walk steadily or firmly without support, but slips about and has an uncertain gait. This is particularly noticed in the dark, and the patient finds that he has to pay special attention to the movements of his lower extremities, in order to carry them on properly. After a while the signs of impaired co-ordination are very evident when the patient is made to walk. He is very unsteady in his movements; tends to stagger and to advance precipitately; and during progression lifts the foot up to an unnecessary height, then throws it forwards and outwards, and brings down the heel with a heavy stamp. On turning suddenly he staggers or falls, and the same thing happens if he shuts his eyes when standing. There is no paralysis, as is proved by the fact that the legs can be easily moved in all directions in the recumbent posture; and the muscles sometimes retain extraordinary power. At last walking becomes impossible, the legs being thrown hither and thither without any appearance of design or control when any attempt at progression is made. The muscles do not waste, and retain their tone. The condition of electric irritability is doubtful, some observers affirming that it becomes much impaired, others that it remains normal; in the early stage it is often exalted. Sensation is frequently much altered; the pains in the limbs continue; often there is tingling or numbness in the toes and feet; cutaneous sensibility is impaired, the patient not feeling the ground properly, but having a sensation as if he were treading on wool or sand; and sometimes there are spots of complete anæsthesia to all stimuli except heat and cold. Muscular sense is also more or less diminished or even lost in advanced cases, the patient not being aware of the position of his legs when lying down, unless he is looking at them. The electric sensibility is said to be impaired in those muscles in which the muscular sense is affected. There is no loss of power over the bladder and rectum as a rule, but the former may certainly be much affected.

In the majority of cases of locomotor ataxy the upper limbs become involved sooner or later. Numbness is noticed in the fingers, generally beginning in the little and ring-fingers, and then often extending to the hand or arm. The movements of the fingers, hands, or arms become clumsy, unduly violent, and uncertain, so that the patient cannot perform any delicate combined movements requiring precision. Moreover, if he shuts his eyes, he cannot judge of the extent or direction of the movements of his upper limbs. The voluntary movements are often executed in a jerky manner. In some instances the muscles of the head, neck, and trunk become involved. Articulation may be impaired; and the different cranial nerves may become implicated permanently. Deglutition and respiration may also be affected. The occurrence of atrophy of the optic disc is stated by Charcot to be due to sclerosis commencing here, and gradually extending backwards along the optic tracts, as far at least as the corpora geniculata. In advanced cases severe and constant aching pains are liable to arise in the head, along the spine, and in the trunk and limbs. Retention or incontinence of urine or fæces may occur; and sexual power and desire are lost. In exceptional cases rigidity, contraction, and wasting of muscles set in, due to the extension of the sclerosis to the lateral columns and anterior cornua. Bed-sores may also arise.

In the course of locomotor ataxy trophic lesions are liable to arise, as has been particularly shown by Charcot. Thus there may be cutaneous eruptions, more especially during periods of exacerbation of the disease, and in connection with neuralgic pains, these eruptions being not uncommonly limited to the area of distribution of the painful nerve. They include lichen, urticaria, herpes zoster, ecthyma, impetigo, and erythema nodosum. Joint-affections are also occasionally met with, usually occurring at the onset of the symptom of co-ordination. The knees, elbows, or shoulders are chiefly implicated, there being much effusion into the joints, with very rapid destruction of the articular surfaces, and not unfrequently dislocation occurs.

The *course* of locomotor ataxy is very variable. The limbs may be involved unsymmetrically. Usually the disease is very chronic, and may last many years before it reaches its full development. In early cases treatment may check its progress, or even lead to improvement or a cure. Usually the disease tends to become worse and worse, perhaps with occasional remissions. Death generally results from intercurrent disease; but may happen from implication of the muscles of deglutition or respiration, renal or vesical disease, or bed-sores.

III. LATERAL SCLEROSIS OF THE CORD.

Two varieties of this affection are recognized. The first occurs as a *secondary* complaint, following some cerebral or other lesion, such as hæmorrhage or softening, from which a tract of descending sclerosis proceeds. If the lesion is in the brain, the sclerosis extends down along the crus cerebri, through the pons, into the anterior pyramid of the medulla, and along the decussation to the opposite side of the spinal

cord, in which it passes down almost entirely along the lateral white column, the superficial portion of which, however, is not involved. The extent of the change becomes more and more confined in its limits, both relatively and actually, as it proceeds downwards. Occasionally the narrow tracts of white matter on either side of the anterior median fissure are implicated, but rarely any other part. If the original disease is seated in the cord, the secondary sclerosis will be more limited.

The second form of lateral sclerosis is *idiopathic*, and here the disease is usually symmetrical, both sides being simultaneously involved. Moreover, lateral extension of the lesion to the anterior cornua usually occurs, with their groups of large cells, and occasionally to the sensory tracts of grey matter, the posterior columns, or the posterior roots. This horizontal extension is almost always most advanced in the cervical region, and becomes gradually less as it proceeds downwards. At a later period the medulla oblongata and its nuclei become affected. After the extension to the anterior cornua, secondary changes in the motor nerves take place sooner or later, with subsequent wasting of the muscles.

SYMPTOMS.—Sclerosis of the lateral columns is characterized by gradually developed paralysis of the muscles to which the affected tracts are related; associated with tremors during attempts to perform voluntary movements; increasing rigidity, easily caused by any kind of irritation, and often coming on in paroxysms; and paroxysms of convulsive trembling in the paralyzed muscles. The rigidity at first implicates all the affected muscles, and causes extension of the limbs, but afterwards the flexors tend to overcome the extensors, and consequently the limbs become bent, often so powerfully that they cannot be stretched.

If the disease is limited to the lateral columns, no further phenomena are noticed. The muscles retain their reflex and electric excitability, and do not waste. In the idiopathic form, however, where the lesion involves other parts besides the lateral columns, additional symptoms arise, varying according to the regions of the cord which become implicated. The chief difference observed is that rapid wasting of the muscles is superadded to the phenomena mentioned above. There may also be pain, numbness, or tingling. The disease is insidious in its onset, and usually involves the arms first, which become speedily emaciated, all the muscles being simultaneously wasted. They retain their electric excitability; are liable to fibrillar vibrations; and on movement tremble more or less violently. The muscles of the neck may become rigid. The legs are affected after a variable interval, but they do not waste except in prolonged cases, and then only exceptionally. They exhibit, however, all the other phenomena. Ultimately symptoms indicating implication of the medulla oblongata and its motor nuclei set in by degrees; or in rare instances these occur at the outset. Idiopathic lateral sclerosis begins in the legs; or gives rise to hemiplegic phenomena; or involves only one arm or leg.

IV. DISSEMINATED OR MULTIPLE SCLEROSIS.

This variety is named *Insular sclerosis* by Moxon; *Sclèrose en plaques disséminées* by Charcot. It includes the forms described by Hammond as *Multiple cerebral* and *Multiple cerebro-spinal sclerosis*. It is characterized anatomically by the morbid condition being arranged in small roundish patches or nodules, scattered irregularly through the nerve-centres. They may be found in different parts of the brain or spinal cord, either separately or together, and often occupy several regions at the same time. In the cerebrum the nodules are seen chiefly in the corpus callosum, corpora striata, optic thalami, and septum lucidum; sometimes in the centrum ovale; very rarely in the grey matter of the convolutions. The corpus dentatum is almost the only part of the cerebellum which is involved. Sclerotic patches may also be found in the pons or medulla. The nerves are in many instances studded with patches, or generally diseased. The nodules are in most cases well-defined, and either project above the surrounding level or are depressed. Charcot states that they may usually be divided into three zones, indicating successive phases of the disease, the innermost zone being most advanced. They vary in size, and also considerably in number in different cases.

SYMPTOMS.—It will be readily understood that the precise clinical history of disseminated sclerosis must be very variable in different cases, and the symptoms are often exceedingly complex. In general terms they include rhythmical tremors; paralysis, especially of the lower extremities; contraction of the limbs; peculiar vertigo, paroxysmal or almost constant; affections of the eyes; defect of speech, with tremors of the lips and tongue; and marked change in the expression and mental condition. In the course of the disease inco-ordination of the movements of the legs may arise; as well as wasting of certain voluntary muscles, and disorders of deglutition, respiration, and circulation.

Hammond describes a typical form of disseminated sclerosis, in which the cerebral hemispheres are mainly involved, of which the following is an epitome:—The progress is almost invariably slow, and in the early stage the chief symptoms are sharp paroxysms of pain in the head, of short duration, with occasionally a permanent feeling of fulness or constriction; and disorders of sensation in other parts, such as hyperæsthesia, numbness in the fingers or toes on one side, or sometimes darting pains like electric shocks. In exceptional cases an epileptic seizure reveals the disease. Motor disturbance is first indicated by tremors or trembling, which may not be observed for a considerable time. The tremors generally begin in a limb, either involving it throughout, or being limited to groups of muscles, or even to a single muscle. Sometimes they commence in other parts, such as the head or eyelid. Their usual tendency is to become more intense, and to extend gradually and in a lateral order, so that ultimately all the limbs may become implicated, as well as in many cases the head, eyelids, eyeballs, lips, muscles of the lower jaw, tongue, or perhaps even the muscles of the pharynx or larynx. At first the trembling may only be noticed when the patient is quiet, and his attention is not occupied. It is not merely set up when voluntary movements are performed, and

is for a long time to some extent under voluntary control, though undue effort to restrain it may have the contrary effect. A change of posture often quiets the movement for a time. Emotional disturbance of any kind increases it. For a considerable time it ceases during sleep, but finally becomes constant. In exceptional cases the tremors commence as violent paroxysms, which the patient cannot restrain, and these increase in frequency until they become permanent.

After a variable interval paralysis gradually sets in, this symptom usually following the tremors, and taking the same progressive course, except in the muscles of the face, where it may arise independently. Ultimately the loss of power may terminate in hemiplegia or general paralysis, the muscles of the head, trunk, face, and eyes being involved, as well as those of deglutition, speech, and respiration. Contractions and distortions of the limbs may follow, especially of the upper extremities. Inability to maintain a continuous muscular contraction, and impairment of the power of co-ordination are prominent symptoms. The patient also loses the knowledge of the situation of the different parts of the body. Electric contractility is not impaired. The attitude and gait become peculiar. "In standing the body is generally inclined forward, the head falling towards the chest, the trunk flexed at the pelvis, and the knees slightly bent. In walking the action is similar to a jog-trot, the body being still inclined forward, and the patient often moving with considerable rapidity." There is in many cases a strong tendency to plunge forward, causing the patient to seize upon some fixed object; hence it is easy to ascend a staircase, but difficult to descend. This peculiar mode of progression is termed "festination." Sometimes the tendency is to go backwards.

As the disease progresses, disorders of sensation become more marked, and the special senses are more affected. White atrophy of the disc is revealed in many cases on ophthalmoscopic examination.

In the last stage the patient becomes quite helpless, and unable to speak or swallow; the constant tremor causes abrasion of the skin; sleep is prevented; urine and feces are passed involuntarily; the mind is enfeebled; and death ensues from gradual exhaustion, coma, or convulsions. The average duration is about five years.

Cerebro-spinal sclerosis.—This variety is particularly liable to irregularity and want of uniformity in its symptoms. These are in many respects similar to those just described, but they present some peculiarities. Sometimes the disease begins in the brain, and the phenomena point to this organ as being the seat of mischief; but generally the cord is first involved, and in most cases spasmodic jerking or twitchings of the limbs are first observed, originating in inflammation or congestion of the spinal meninges. The peculiar features of cerebro-spinal sclerosis are said to be that paralysis is usually noticed before the tremor; while the latter is only evident when a voluntary movement is made. The legs are generally much more paralyzed than the arms, and they are very liable to bed-sores. Ultimately the condition becomes much the same as in multiple cerebral sclerosis, but the mind in the great majority of cases remains clear to the last, the hemispheres being but seldom involved.

V. GLOSSO-LABIO-LARYNGEAL PARALYSIS—BULBAR PARALYSIS.

In this affection the sclerotic condition involves the nuclei of origin of the hypoglossal, facial, pneumogastric, and spinal accessory nerves, in the medulla oblongata and upper part of the spinal cord. Afterwards the disease implicates the roots, and may extend along the trunks of the nerves. It may also pass down the cord to a variable extent. The muscles which are affected in this complaint present a healthy aspect.

SYMPTOMS.—The chief clinical phenomena depend upon paralysis of the muscles of the tongue, palate, and pharynx, and of the orbicularis oris. In course of time the larynx and respiratory muscles become involved. In the great majority of cases the tongue is first affected, which is indicated by some embarrassment of speech and impaired articulation. Special difficulty is experienced in raising the tip of this organ to the roof of the mouth, or in bringing it against the upper teeth; hence words beginning with lingual and dental consonants give most trouble. Then dysphagia is experienced, particularly as regards fluids, which are apt to pass into the larynx or through the posterior nares, causing much distress and danger. Consequently saliva accumulates in the mouth, assuming a viscid, glutinous, stringy character, and it flows out instead of being swallowed. Food collects between the gums and cheeks, because the tongue cannot remove it. When the orbicularis oris becomes involved, the lips remain apart and cannot be closed, so that the teeth are exposed, and the patient presents a peculiar and most unpleasant aspect. In time articulation and deglutition become impossible, the tongue remains at the bottom of the mouth as a sodden, inert mass, and the patient has to be fed. General debility results, in consequence of the interference with nutrition. Subsequently the implication of the respiratory muscles leads to difficulty of breathing, and inability to cough; while, when the larynx is affected, voice becomes absolutely lost. The mind is usually clear to the last, but the emotions are easily excited. If the disease extends down the cord, muscular atrophy or paralysis is observed in the corresponding muscles. Bulbar paralysis always proves fatal, death resulting either from gradual or sudden asphyxia; from exhaustion; from interference with the cardiac action; or from some intercurrent complaint.

VI. GENERAL DIAGNOSIS, PROGNOSIS, AND TREATMENT.

1. DIAGNOSIS.—The different forms of sclerosis are usually sufficiently clearly indicated by their clinical history. In the early stages *locomotor ataxy* is liable to be mistaken for rheumatism or neuralgia, but when the symptoms of inco-ordination appear, there is no difficulty in the diagnosis. *Idiopathic lateral sclerosis* somewhat resembles wasting palsy at first, but is much more rapid in its progress, and the muscles are simultaneously involved; when the muscles contract, there is no difficulty in the diagnosis. *Diffused cerebral sclerosis* may be mistaken for simple atrophy of the brain; cerebral tumour; or, in persons of advanced

years, for cerebral hæmorrhage, embolism, or thrombosis. The *disseminated* form has to be distinguished from paralysis agitans; chorea; or tremor following hemiplegia due to cerebral hæmorrhage or any other cause. Labio-glosso-laryngeal paralysis may be confounded with simple paralysis of the tongue; facial paralysis, especially double; general paralysis of the insane; progressive muscular atrophy beginning in the tongue, lips, or palate; or diphtheritic paralysis.

2. PROGNOSIS.—This is always grave, but in some forms of sclerosis arrest of the disease, or even improvement may be effected at an early period by appropriate treatment. In advanced cases the prognosis is very unfavourable, and sooner or later a fatal issue may be always anticipated.

3. TREATMENT.—It is important in all varieties of sclerosis to maintain the general health by means of good diet, tonics, cod-liver oil, strychnine, and such remedies. If the patient cannot swallow, it may be desirable to introduce food by the stomach-pump or enemata. Passive exercise in the open air may be of service. If any syphilitic taint is suspected, iodide of potassium and bichloride of mercury should have a fair trial. Large doses of iodide of potassium have been also found useful in the treatment of locomotor ataxy. Hammond recommends, when sclerosis affects the brain, chloride of barium, gr. i three times a day, and tincture of hyoscyamus, ʒij morning, noon, and night. In the spinal forms, if there are signs of congestion in the early stage, he gives ergot; later on, nitrate of silver and cod-liver oil. Various baths have been employed, but are of questionable use. Electricity is often of much service. The primary current should be applied along the nerve-centres and to tremulous muscles; and the induced current to paralyzed parts. Symptoms must be attended to as they arise; and cleanliness strictly enjoined.

CHAPTER LXXII.

ON CERTAIN SPECIAL NERVOUS DISEASES.

I. PROGRESSIVE MUSCULAR ATROPHY—WASTING PALSY— CRUVEILHIER'S PARALYSIS.

ÆTIOLOGY AND PATHOLOGY.—Wasting palsy has been attributed pathologically to an atrophic and degenerative change beginning in the involved muscles themselves; in the anterior roots of the nerves supplying them; or in the spinal cord; but there is no certainty with regard to this matter. The chief supposed *exciting causes* are exposure to cold and wet; a blow or fall on the neck or back; and excessive use, with consequent fatigue of the affected muscles. The disease occurs by far most commonly in males, and usually in persons about 30 years of age, though it may be met with at any period from childhood to old

age. In some cases it appears to be hereditary, or to affect several members of the same family.

ANATOMICAL CHARACTERS.—The affected muscles are wasted more or less, pale and yellowish, and soft, the muscular fibres being replaced by a granular, fatty, gelatinous tissue, through which the tendons pass. The muscles are altered to a very variable degree, and one may be found quite destroyed while that next it is unchanged, or healthy bundles of muscular tissue may be seen in the midst of the morbid material. The upper portions of the muscles are usually most changed. The anterior roots of some spinal nerves and the sympathetic branches joining them have been found atrophied, the nerve-elements being replaced by a finely-granular tissue. The chief alterations in the cord have been found in the anterior columns, and the lesion is supposed by some authorities to be inflammatory, and to end in a sclerotic change, with atrophy and pigmental changes in the nerve-cells.

SYMPTOMS.—Wasting palsy sets in very insidiously. It usually begins in either shoulder or hand, especially in the right deltoid, but gradually advances from its starting point so as to invade other muscles, until finally every voluntary muscle in the body may be involved, except those of the eyeballs and eyelids, and the muscles of mastication. Occasionally the muscles of the neck are first implicated, and rarely those of the face. There is loss of power, corresponding in situation, extent, and degree to the wasting, and this may culminate in absolute helplessness, with inability to swallow, speak, or breathe, death then resulting from asphyxia. At the same time there are marked objective signs of the atrophy of the muscles, which are well seen about the shoulders and in the hands, the latter assuming the "claw-hand" shape, characterized by deep depressions due to the wasting of the muscles, while the tendons stand out, and the fingers are drawn in towards the palm, being also pushed back; the ball of the thumb is much wasted; the shoulder is flattened or depressed, and the bony prominences seem to stand out. The tissues have a soft, flabby feel. The face assumes a vacant, idiotic expression when its muscles become affected. During the progress of wasting the muscles present constant flickering movements so long as any muscular tissue is left, which are more marked if the skin is exposed to cold or blown upon. The irritability and force of contraction under electricity become diminished in proportion to the waste of tissue. The mind is unaffected to the last. Pain may or may not be complained of in the affected parts. There is never any loss of power over the bladder or rectum, and the heart is never implicated. In some cases the disease does not spread to the extent above described, but is arrested in its progress, the patient ultimately recovering, especially when it is due to fatigue of special muscles.

DIAGNOSIS.—The conditions which are liable to be mistaken for progressive muscular atrophy are paralysis from local injury or from disease of a nerve; idiopathic lateral sclerosis; chronic lead-poisoning; essential paralysis; and general paralysis of the insane. Attention to the history, symptoms, and mode of progress of the complaint will generally make the diagnosis evident.

PROGNOSIS.—Improvement can often be effected by early treatment, but in advanced cases very little can be done, especially if the disease

is extensive and rapid in its progress. The prognosis is more favourable when the complaint is due to fatigue; while it is worse if any hereditary tendency is evident.

TREATMENT.—If wasting palsy has arisen from excessive use of certain muscles, these must be allowed to rest. Improvement of the general health is highly important, by means of nutritious diet, tonics, change of air, and gentle regular exercise. Warm or sulphur-baths have been recommended, but cold baths should not be used. The chief local methods of treatment are systematic friction, for which some simple liniment may be employed; passive motion; and electricity. The continuous and interrupted currents are both serviceable, and their persevering use proves often very beneficial. According to Duchenne, "the more a muscle is atrophied and its contractility diminished, the longer it should be subjected to the stimulation, the more intense should be the current, and the more rapid its intermissions. When the sensibility is seen to return, it is prudent to diminish the intermissions and abate the intensity of the current." Pain may be subdued by warm fomentations or baths; or, if it is severe, by the hypodermic injection of morphia.

II. ESSENTIAL PARALYSIS OF CHILDREN—INFANTILE PARALYSIS.

ÆTIOLOGY.—The causation of infantile paralysis is but little known. The complaint occurs in the large majority of cases between 6 months and 3 or 4 years of age, especially in the second year of life, but it may be met with in patients from 2 months to 8 or even 10 years old. Sex and constitutional condition have no influence. It sometimes follows one of the acute exanthemata or other febrile conditions, and has also been attributed to painful dentition; injury to the back; cold from lying on damp ground, or simple exposure to cold and wet; and digestive derangements.

ANATOMICAL CHARACTERS.—The nature of infantile paralysis is by no means agreed upon by pathologists. It appears to be primarily due to some disease of the spinal cord, and this is generally supposed to be of an inflammatory nature. The neuroglia and nerve-cells are usually involved, but Charcot believes that the inflammatory process begins in the latter, as it is sometimes limited to them, or only the immediately surrounding neuroglia is implicated. The lesion occupies the anterior cornua in different regions, but not necessarily in a symmetrical manner. It may occur in scattered patches, or tolerably uniformly, and throughout a considerable extent vertically. Finally more or less of a sclerotic change takes place, so that the affected cornua shrink and become indurated. The groups of large cells undergo atrophy or pigmental degeneration, and may ultimately disappear entirely. Secondly the motor nerves become atrophied after a time, the nerve-tubules becoming smaller, and losing their medullary sheath. The involved muscles also shrink rapidly; there is some increase of the cells of the sarcolemma, and, according to some observers, of the intervening connective tissue. Subsequently the muscular fibres become atrophied, and undergo more or less fatty degeneration, often with increase in the connective

tissue ; and sometimes a large accumulation of fat takes place, causing the muscles to be enlarged.

SYMPTOMS.—The invasion of infantile paralysis is usually indicated by some *premonitory* symptoms, especially pyrexia, generally not very marked and exhibiting remissions, which lasts from 24 to 48 hours ; sometimes by convulsions, not involving the face, and unattended with cerebral symptoms. In exceptional cases mental excitement, delirium, or loss of consciousness is noticed at the outset ; or the paralysis may set in suddenly without any warning. At first the paralysis is often more or less general, affecting both sides, but usually the lower limbs more than the upper, so that the child lies quite helpless ; in other instances it is limited to one or more of the limbs. The implicated muscles are relaxed. Sensation is not perceptibly affected as a rule, but elder children may complain of pains in the limbs and back, and there may be some numbness, which, however, soon disappears. The sphincters are not involved. Reflex excitability is impaired or abolished, but electric irritability seems to be retained. In rare instances the paralysis disappears entirely in a few days, and the patient is completely restored. The ordinary course of events, however, is for some of the limbs or muscles to recover in from two or three days to a fortnight, while others remain permanently paralyzed. This permanent paralysis is generally of paraplegic distribution, though one leg is more affected than the other ; in exceptional cases it is hemiplegic, or a leg and an arm may be implicated on opposite sides, or the paralysis may be confined to one limb, or even to a part of it. Subsequently the paralyzed parts become atrophied, limp, and stunted in their growth ; electric irritability is entirely lost ; all their tissues undergo degeneration ; the local pulse becomes small, and the circulation languid ; the temperature falls considerably ; and various deformities and distortions arise, according to the part involved, such as club-foot, flexion of the hips, &c., which are much aided by the great laxity of the ligaments. Those who have been subjects of infantile paralysis often live to an advanced age, and many belong to the class of mendicant cripples.

DIAGNOSIS.—Until the paralysis sets in there is nothing distinctive about this complaint, but at this time its symptoms are sufficiently characteristic. In very young infants it may be difficult to make out the paralyzed condition. The diseases which might possibly be mistaken for infantile paralysis are meningeal hæmorrhage ; paralysis following diphtheria ; myelitis ; and tumours or other morbid conditions of the brain.

PROGNOSIS.—Caution is always necessary in giving an opinion on this point. Recovery is often brought about by appropriate treatment, if commenced early and persevered in. The prognosis is worse in proportion to the intensity of the initiatory fever ; to the loss of power ; to the degree of wasting ; and to the impairment of electric contractility. So long as electro-contractility remains, improvement may be anticipated, but if this is quite extinguished a cure is impossible.

TREATMENT.—In the premonitory stage nothing need be done except to keep the patient in bed, and watch the progress of events. When the paralysis is evident, the important measures to be adopted are daily friction of the affected parts with olive oil or some stimulating liniment ;

passive movements of the limbs, or, if the patient is old enough, active movements; and the persistent use of electricity. The continuous current of fair strength should be applied to the affected muscles for 10 or 15 minutes twice daily; and after a time a weak induced current may be employed. Gymnastics and mechanical appliances must be had recourse to, in order to prevent or to make up for deformities. Operations may also be required. The general health should be supported by nutritious diet, change of air, baths, cod-liver oil, iron, strychnine, and similar remedies.

III. ADULT SPINAL PARALYSIS. GENERAL SPINAL PARALYSIS.

These two affections may be briefly alluded to in this connection, as they are supposed to be of the same nature as the infantile paralysis just considered.

Adult spinal paralysis has been chiefly described by Duchenne and Charcot. It begins with febrile symptoms, and not unfrequently pain in the spine, with forward curvature, and some degree of pain in the limbs; motor paralysis, of variable extent, occurs either from the outset or speedily; cutaneous sensibility is unaffected; there is no loss of power over the bladder or rectum; nor is there any tendency to the formation of bed-sores. The affected muscles are flaccid, and tend rapidly to waste and to lose their electric contractility. Subsequently various degrees of improvement take place in the muscles; and deformities do not occur.

General spinal paralysis usually occurs between 35 and 40 years of age. It comes on insidiously, without any fever or other symptoms. Usually the paralysis begins in the legs and travels upwards; sometimes it starts in the arms. It progressively increases in degree, the affected muscles being flaccid from the outset. They rapidly lose their electric contractility more or less; and also speedily waste, all the paralyzed muscles undergoing this change simultaneously, so that the limbs shrink markedly. The skin is apt to become cold and livid. The muscles of the trunk, head, and neck are afterwards involved; and if the disease is not arrested, the medulla oblongata becomes involved, with the usual consequences. In most cases the paralysis is more marked on one side than the other. It usually progresses, either continuously or with remissions or intermissions; or temporary improvement may take place; or even complete restoration, either permanent or followed by subsequent relapse. Recovery may occur even after a long duration of the disease.

TREATMENT.—But little can be done in these affections by the aid of medicines. The use of galvanism is the most reliable measure.

IV. WRITER'S CRAMP—SCRIVENER'S PALSY—MOGIGRAPHIA.

ÆTIOLOGY AND PATHOLOGY.—The form of nervous disorder thus named is but one of a group, in which sets of muscles habitually and frequently exercised for certain complicated actions become the seat of

peculiar spasmodic movements. It occurs principally among those who write a great deal, such as teachers, merchants, and clerks, but similar derangements are met with in connection with other occupations, such as amongst violinists, pianoforte players, watchmakers, engravers, sempstresses, milkmaids, shoemakers, and nailsmiths. Over-work of the affected muscles seems to be an important element in the causation of the malady, and it is aggravated by mental worry and anxiety. Among writers the use of a steel-pen, the wearing of a tight coat-sleeve, and an inconvenient and constrained attitude have been considered as *predisposing causes*. Writer's cramp never occurs under 30 years of age; and is far more frequent among males than females.

The pathology of writer's cramp is very doubtful, but the affection has been attributed to some morbid condition or a state of mal-nutrition of the nerve-centre governing the implicated muscles, with consequent diminution in nerve-force, or loss of co-ordinating power; to chronic fatigue of these muscles; to a reflex neurosis from muscular nerves; or to the transmission of voluntary impressions to other motor nerves besides those which are intended, sympathetic movements being thus excited.

SYMPTOMS.—The earliest symptom in most cases of writer's cramp, which may be taken as a type of all similar diseases, is a sense of fatigue and aching in the hand after writing, especially in the thumb, as well as often in the muscles of the upper extremity. The patient finds that he must hold his pen more firmly, and give more direct mental attention to the act, in order to write properly. This only aggravates the mischief, however, and in time control over the muscles concerned in the act becomes diminished or lost, so that irregular spasmodic movements are excited in the fingers and thumb whenever any attempt at writing is made. The thumb may be convulsively flexed, the pen getting over its knuckle; the index-finger is jerked; or the first three fingers exhibit disorderly spasmodic movements. Of course the writing is more or less altered, and ultimately becomes mere illegible scribbling. The patient learns to alter his mode of writing, using the hand, wrist, elbow, and shoulder in succession, but as he does so the corresponding muscles present similar spasmodic movements. Then he takes to writing with the left hand, which becomes affected in the same manner.

The symptoms just mentioned are intensified by mental excitement, and by anxiety on the part of the patient to write properly. They cease immediately the attempt to perform this act is given up, and all other actions can be carried on without any difficulty or disorder. In some cases a dull pain is experienced in the muscles of the limb, or a feeling of weight and tightness; but ordinary sensation, electric irritability, and nutrition are in no way impaired. In exceptional cases headache, vertigo, mental dulness, occasional tremors, and other nervous symptoms are observed. The general health is usually good, but the patient is liable to be depressed in spirits.

DIAGNOSIS.—There is but little difficulty in recognizing the disease now under consideration, if attention is paid to the occupation of the patient, and the peculiar course of symptoms above described. It might possibly be mistaken for wasting palsy; or for the effects of chronic lead-poisoning.

PROGNOSIS.—If the condition has only existed for a short time, a

cure may be expected under appropriate treatment ; but in cases of long duration the prognosis is most unfavourable.

TREATMENT.—All attempts to check the progress of writer's cramp by using quill-pens, altering the mode of writing, employing douches and friction, and such measures are quite ineffectual, and an essential part of the treatment consists in absolute and prolonged rest from the particular employment which is the cause of the complaint, or, if possible, it should be given up altogether. The regular use of the continuous current has proved serviceable, applied to the muscles and nerves of the arm, and along the spine. Dr. Poore employs this agent along with voluntary movements of the muscles. When nothing can be done in the way of improvement, patients can sometimes manage to write by using some special apparatus.

V. PSEUDO-HYPERTROPHIC MUSCULAR PARALYSIS—DUCHENNE'S PARALYSIS.

ÆTIOLOGY.—The *exciting causes* of this peculiar affection are quite obscure. Pathologically it has been attributed to some lesion of the motor and trophic nerve-cells in the spinal cord, and has been considered to be the same disease as progressive muscular atrophy. It commences almost always during infancy or early childhood, and is by far most common in boys. In exceptional cases the disease begins in adults. Hereditary predisposition is supposed to exist occasionally.

ANATOMICAL CHARACTERS.—The obvious changes are associated with those voluntary muscles which are affected, these being increased in size and very firm, while they present important structural alterations, the muscular fibres having to a great extent disappeared, many of those which remain being atrophied or in a state of degeneration, while the great mass of the apparently-enlarged muscles is made up of fat and fibrous tissue, the latter being partly the remains of the sheaths of the muscular fibres, partly the result of proliferation. In advanced cases other muscles are simply atrophied. Many observers have been unable to detect any morbid condition of the spinal cord, but extensive degeneration of the central grey matter and anterior commissure, as well as other changes, have been described by Lockhart Clarke and Gowers.

SYMPTOMS.—Pseudo-hypertrophic muscular paralysis is a very chronic disease, and its progress has been divided into certain stages, the duration of which presents much variation. The muscles first affected are those of the legs and back, especially those of the calves, back of the thighs, and gluteal regions, and the erector spinæ. At the outset these are merely weak, which may be noticed when the child begins to walk. Subsequently they increase in size, and then the characteristic symptoms become evident. These are :—1. Enlargement and unnatural firmness of the calves, back of the thighs, and lumbar region. 2. Peculiarities in the attitude. When standing the patient is evidently unsteady, and keeps the legs wide apart, with the heels raised ; the shoulders are thrown back, and the antero-posterior curve of the

spine is much exaggerated, so that the abdomen appears peculiarly prominent, but this prominence subsides in the sitting posture. 3. Peculiarities affecting the mode of progression and movements. In walking the legs are also much separated, the patient supports himself almost on tiptoe, and the body is balanced, first on one leg then on the other, with a kind of waddling movement. The patient easily stumbles or falls, especially on attempting to walk rapidly, and soon becomes tired. Stooping is easily effected, but it is very difficult then to gain the erect posture, except when the patient is sitting down.

In course of time the muscles of the upper part of the trunk, of the arms, or even those of the face become involved. These may be also evidently enlarged, but more commonly wasting of the upper part of the body is observed, contrasting markedly with the enlargement of the lower portion. The paralysis becomes more marked and extensive, and ultimately the patient lies in a completely helpless condition, at the same time the muscles formerly hypertrophied undergoing wasting. The mental faculties may become impaired; and headache, disorders of vision, and other evidences of cerebral disturbance may be noticed before the close. Death results either from gradual exhaustion; from implication of the respiratory muscles; or from some intercurrent malady.

Very different statements have been made as to the electric contractility of the affected muscles. It is probably usually impaired to the induced current, but has been found increased as regards the primary current. Portions of the diseased tissue may be removed for examination during life, by means of Duchenne's trochar.

DIAGNOSIS.—In a well-marked case there is no difficulty in recognizing this disease. It might possibly be mistaken for true muscular hypertrophy; or for spinal disease.

PROGNOSIS.—This is usually very unfavourable. Instances of recovery in the early stage have been reported, and improvement has been effected in more advanced cases, but these are exceptions. Life may be prolonged for many years.

TREATMENT.—No drug has any direct influence upon Duchenne's paralysis. Tonics may be of some service. The only measures from which any benefit can be expected are shampooing and kneading; cold douching; and the use of electricity. Local faradization of the affected muscles is of much use, and the application of the primary current along the spine and sympathetic nerve has also been recommended.

VI. PARALYSIS AGITANS—SHAKING PALSY.

Many cases which have been described as paralysis agitans were merely those of multiple sclerosis. As a distinct affection it is presumed to be a functional disorder; or at any rate no definite organic lesion has as yet been made out.

ÆTIOLOGY.—Paralysis agitans has been mainly attributed to violent emotion; long-continued anxiety or grief; continuous or severe exertion; injury; and exhausting diseases. Special varieties of the com-

plaint have been described as *hysterical*, which occurs in hysterical persons; *reflex*, due to some reflex irritation (worms, wounds, &c.); and *toxic*, resulting from the action of some poison upon the system (mercury, alcohol, tobacco, tea, or coffee). The persons affected may be of any age, but are usually under 50.

SYMPTOMS.—The chief symptom of paralysis agitans is tremor, either very limited or more or less extensive, and usually exhibiting little or no tendency to advance. It is independent of voluntary movements, but may be controlled by holding the affected part. Mental excitement, fatigue, and depressing influences increase the movement, which, except in extreme cases, ceases during sleep, and may present intermissions during the day. Diminution in muscular power is perceptible, but is not marked as a rule. Sensibility is not affected, and there are no head-symptoms or festination. The duration is indefinite; there is no fatal tendency; and in many cases, especially if the cause can be removed, a cure may be effected.

DIAGNOSIS.—Paralysis agitans might be mistaken for multiple cerebral or cerebro-spinal sclerosis, or for chorea. Attention to the ætiology and symptoms indicated above will enable the diagnosis to be made.

PROGNOSIS.—Death is a very rare event from paralysis agitans. It may, however, prove a very difficult complaint to cure.

TREATMENT.—The indications in the treatment of paralysis agitans are to remove the cause; to give good diet; to avoid fatigue and mental excitement; to improve the general health and condition of the nervous system by strychnia, iron, phosphorus, arsenic, zinc, and similar remedies; to administer *sedatives*, such as bromide of potassium, opium, conium, or cannabis indica; and to apply the constant current along the affected muscles and over the spine. Baths and friction might also be of service.

CHAPTER LXXIII.

DISEASES OF THE SKIN.

A CONSIDERATION of the offices and functions of the skin is of great importance alike to the physiologist and the practitioner of medicine. As an external integument the skin affords a soft and flexible protection to the delicate vascular tissues beneath; and as the seat of distribution of the peripheral terminations of many of the sensory nerves, it serves as an important and exquisite organ of the sense of touch. But it has other functions which are equally important to the animal economy. By means of its sebaceous and sudoriparous glands the skin secretes and excretes a large amount of fatty matter, sweat, and nitrogenous products; and exhales a great quantity of water and some carbonic acid gas. In addition to these properties, it is also capable of some degree of absorption of fluids and drugs. The functions of the skin, therefore, correlate those of the kidneys, lungs, intestinal

mucous membrane, and probably also some of those of the liver and other emunctory organs. These facts have not been overlooked by physicians, who not unfrequently make use of the skin to relieve by diaphoresis the action of the kidneys or lungs, when either of these organs is acutely inflamed. But, on the other hand, dermatologists have, as a rule, been slow to return the compliment by making the kidneys, lungs, and intestines do the work of a disabled skin. The truth is that, hitherto, diseases of the skin have been looked upon as peculiar in their nature, and altogether different from the morbid changes that occur in other tissues, and to be treated therefore in some special way. The ordinary rules of practice have, in consequence, been too commonly neglected in the treatment of skin-affections. It will be, however, one of the objects of this chapter to endeavour to show that really few pathological changes occur in the skin that may not—allowing for differences in situation and structure—be repeated in the other tissues and organs of the body.

If more care were taken to elicit all the facts in the histories of the cases brought before us, and more pains were bestowed upon the elucidation of the pathological relations of the various morbid phenomena that the skin presents, it would be found that a very large number of diseases of the skin are really directly or indirectly due to changes in the internal viscera, or in the vascular or the nervous system. Many, I feel sure, are neurotic, but this is not the place to attempt to differentiate between idiopathic diseases of the skin, and symptomatic diseases or diseases which are, as it were, merely the cutaneous reflection of internal changes. Let it suffice for our purpose that the term "skin-disease" applies to every deviation from the normal condition of the structure and function of the skin and its appendages, the glands, hair, and nails. In the following pages, however, only those diseases will be discussed, and that very briefly, that are likely to come under the notice of the medical practitioner and student in this country. Nor shall we consider those affections that have, by tradition and custom, been unreservedly given up to the charge of the surgeon. An account of these may be found in surgical works.

But in order to study diseases of the skin intelligibly and profitably, we must adopt some method of classification. The best method, perhaps, would be an anatomico-pathological one, the different diseases being divided into two great classes, namely, those having a *constitutional* origin; and those purely *local*, and peculiar to the skin itself, the morbid changes themselves being distinguished by the particular portion of the cutaneous tissue they affect. Unfortunately such a classification is, in the present state of our knowledge, impossible.

Many skin-affections are clearly dependent on constitutional conditions, and many are purely local, but there is an intermediate class which is sometimes local, sometimes constitutional. For instance, some diseases which are local may be aggravated or determined by constitutional conditions; while many affections having their real origin in some morbid condition of the general system, are determined by some cause acting locally. On the other hand, a strict anatomico-pathological classification would be liable to become too complicated by the never-ending extensions and modifications of morbid action.

In this country, the system first proposed by Plenck, and subsequently adopted and elaborated by Willan, is the one most commonly accepted; but although it possesses certain practical advantages, it is open to the grave objection of including in the same order diseases which, beyond possessing one perhaps insignificant common character, are widely different.

The following plan, which is that suggested by the late Dr. Tilbury Fox, seems to possess the advantages of the Willanean system, on which, indeed, it is founded. It is, however, free from some of the faults of that system, and may be taken as that best adapted for the purposes of clinical study, and most likely to prove subservient to modern educational requirements.

Diseases of the skin may be classified as follows:—

1. THE ERUPTIONS OF THE ACUTE SPECIFIC DISEASES.—These have already been fully described.

2. INFLAMMATIONS, comprising—*a.* The *Erythematous*, as erythema, roseola, and urticaria. *b.* *Catarrhal*, as eczema. *c.* *Bullous*, as herpes, pemphigus (?). *d.* *Suppurative*, as ecthyma, impetigo, impetigo contagiosa, and furunculus. *e.* *Papular* or *plastic*, as lichen and prurigo. *f.* *Squamous*, as psoriasis, pityriasis simplex, and pityriasis rubra.

3. DIATHETIC AFFECTIONS, due to some constitutional change or disposition, as struma, syphilis, leprosy.

4. HYPERTROPHIES, as xeroderma, ichthyosis, corns, warts and papillary tumours, keloid, molluscum fibrosum, elephantiasis arabum, &c.

5. ATROPHIES, as general or local atrophy of the skin or its appendages, and senile decay.

6. NEW FORMATIONS.—Lupus, rodent ulcer, cancer, melanotic sarcoma.

7. HÆMORRHAGES, as purpura, which has already been described.

8. NEUROSES, as hyperæsthesia, anæsthesia, pruritus, angioneurosis.

9. PIGMENTARY CHANGES.—*a.* *Increased*, moles, melasma, chloasma, lentigines. *b.* *Diminished*, leucopathia, albinism.

10. PARASITIC DISEASES.—*a.* *Dermatozoic*, as scabies, phtheiriasis. *b.* *Dermatophytic*, as tinea favosa, tinea tonsurans, tinea kerion, tinea circinata, tinea sycosis, tinea versicolor, onychomycosis, and, according to some, tinea decalvans.

11. DISEASES OF GLANDS AND APPENDAGES.—*a.* *Sweat-glands*, miliaria, sudamina, lichen tropicus, dysidrosis, hyperidrosis, anidrosis, chromidrosis. *b.* *Sebaceous glands*, seborrhœa, comedo, acne, milium, molluscum contagiosum, xanthelasma, steatoma. *c.* *Hairs and their follicles*, sycosis, alopecia, calvities, fragilitas, polytrichia. *d.* *Nails*, atrophy, hypertrophy, and onychia.

ERYTHEMATOUS INFLAMMATIONS.

Under this heading will be described only the exudative erythemata, all of which are characterized by redness, due to hyperæmia of the capillaries of the papillary layer of the skin; and by the exudation of a certain amount of serous fluid into this layer and into the rete Malpighii. The exudation may in some instances be so small in quantity as to be

entirely overlooked, and in others sufficient to cause swelling of and amongst the epidermic cells, as in the wheals of urticaria, or even to form vesicles or bullæ, as in the bullous variety of urticaria. The redness readily disappears on pressure, but returns immediately the pressure is removed. When the congestion subsides, there is generally more or less furfuraceous desquamation of the cuticle detached by the exudation. The *exciting causes* are local and constitutional. In the former the hyperæmia and exudation are almost the only phenomena present; but in the latter some febrile reaction, which is sometimes very severe, usually precedes the appearance of the redness. The duration varies from a few hours to several days.

Erythema is a diffuse or circumscribed inflammation of the superficial parts of the skin, characterized by the presence of slightly elevated, red patches of various sizes, the colour of which shades off towards the edges. The redness disappears under pressure, leaving a yellowish stain, due to the presence of serum in the lower layer of the cuticle, but at once returns when the pressure is removed. There is generally heat, tingling, and itching, and sometimes severe pain, together with a certain amount of constitutional disturbance, but the actual course varies according as the disease is of local or constitutional origin. When redness is due to friction of two folds of skin, or to the irritation produced between them by retained secretion, it is called *erythema intertrigo*. The redness that is sometimes seen on the hot, tense, fissured skin of oedematous legs, and which occasionally leads to superficial ulceration, is named *erythema læve*; and the redness of an unbroken chilblain has received the dignified appellation *erythema pernio*.

But more important than these are the constitutional varieties. In *erythema papulatum seu tuberculatum* there are papular red patches and tumefactions scattered about the body, but more particularly on the dorsal aspects of the hands, arms, feet, and legs, generally attended with a disagreeable burning sensation, and a certain degree of fever. In a few days the redness disappears, leaving papules covered with fine scales of desquamating epidermis. In a short time the disease passes off entirely, no secondary changes, as pigmentation or thickening, so frequently seen in prurigo, remaining. In some rare instances the complaint becomes chronic. The disease is most common in the spring and autumn, and chiefly occurs in children and young adults. Several minor varieties have been named after the accidental shapes that the patches sometimes assume, as *erythema iris*, *circinatum*, *gyratum*; while the term *erythema fugax* is given to the transient red patches that sometimes show themselves on the neck and face, due to errors of diet, and other causes. The most important variety, however, is that called *erythema nodosum*, which consists of well-defined, oval or circular, slightly elevated, red patches, from a quarter of an inch to an inch and a half in diameter, which usually occur on the front of the legs parallel to the tibia, the swelling and redness gradually shading off into the surrounding tissues. In a day or two the swellings, which were at first pale and then yellow, assume a purplish tinge, and soften in the centre, but never suppurate, and finally disappear with desquamation of the cuticle. The disease is, however, liable to recur, especially if the health remain impaired. Sometimes the patches, which are due to a serous exudation in the

deeper layers of the skin, show themselves on the upper limbs, and also on the face. Erythema nodosum is met with for the most part in children, especially girls, and in delicate adults, being generally preceded by some febrile disturbance; and it has been observed to be frequently associated with acute rheumatism.

Roseola is a non-contagious, febrile disease, accompanied by the eruption on the skin of minute, rose-coloured, non-crescentic spots, which are generally attended with considerable itching and tingling. There is not necessarily any catarrh; and the eruption is very irregular in its situation and extent. The disease is frequently seen in infants, hence the term *roseola infantilis*; and the variety which occurs from exposure to the sun in summer is called *roseola æstiva*. The redness, which is usually preceded by some constitutional disturbance, lasts from a few hours to several days. A roseolar rash sometimes precedes the outbreak of the variolous eruption or an attack of typhus fever, and occasionally it makes its appearance four or five days after vaccination. It is often seen also in gouty or rheumatic persons, and may occur in cholera. All these varieties have been honoured with special names. Certain medicines, as belladonna and copaiba, may produce a roseolous rash on the body, which rapidly disappears on the discontinuance of the drug.

Urticaria is due to the rapid serous infiltration of the lower layer of the epidermis, which results in the formation of slightly elevated, pale patches, of various shapes and sizes, known as "wheals." That this is the true immediate cause of the wheal may be proved by puncturing the swelling, and letting out the transparent clear serum. The operation, however, requires to be done with very great care, for, if the point of the needle pass beyond the rete Malpighii, the vascular papillæ will be readily made to bleed. This explanation is, moreover, confirmed by the fact that the exudation is sometimes sufficient to raise the cuticle, and to produce a vesicle or even a bulla, as in *urticaria vesiculosa vel bullosa*. There is always in urticaria a considerable amount of itching and tingling, which may last a few minutes or for many days. The constitutional symptoms are not usually severe, but sometimes there is high fever, vomiting, dry tongue, and even delirium. The wheals are, as a rule, very transient, and do not usually last more than an hour or two, but sometimes they last many hours or even days. The paleness of wheals is owing to the pressure which the exuded serum exerts on the papillæ. Urticaria may be acute or chronic, and is due to local or constitutional causes, or to the presence of certain poisons in the blood. There are, therefore, many distinct varieties of the complaint, all of which may, perhaps, be ultimately traced to the same cause, namely, irritation. The irritation is not, of course, always the same. Sometimes it arises from something applied to the skin, and sometimes is attributable to something from within. Hence we have *urticaria from external irritants*, as the bites of insects and the stings of nettles; and *urticaria from irritants that have gained admission into the body with the food, urticaria ab ingestis*, such as shell-fish, certain kinds of fruits, and some drugs, as belladonna or copaiba. Urticaria is common in gouty persons, especially if the skin be irritated, and it may occur in any one whose system is surcharged with waste products.

It is also liable to appear in women who suffer from amenorrhœa or other uterine disturbance—*urticaria uterina*; and may occur from gastro-intestinal disturbance of any kind. In such instances the skin-lesion is distinctly neurotic and reflected. When pyrexia accompanies the formation of wheals, and this is the case oftentimes in *urticaria ab ingestis*, the disease is called *urticaria febrilis*. If the complaint recurs again and again, or continues for a long time, it is termed *urticaria chronica*. There is, lastly, another variety, which is seen in children, in whom, from gastro-intestinal disturbance or from mere local irritation, an obstinate urticaria is developed, which leaves behind a crop of papules due to the engorgement of the papillæ and follicles of the skin. This has been called *urticaria papulosa*, or *lichen urticatus*. The child affected will be found to suffer in the early stage from what seem oftentimes to be bug-bites, but are really small wheals; they appear at night with much irritation, and may be more or less general over the body. These wheals leave papules behind, which become scratched and thereby altered in aspect, so that the disease presents a resemblance to scabies, but there are no cuniculi present.

TREATMENT.—It will be seen that constitutional and local remedies will be necessary in the majority of cases of erythematous inflammations, but in all the cause must be removed. Locally, soothing applications are best, as the various preparations of zinc, calamine, or lead. Excoriated surfaces must be protected, and where the surface is chafed by the friction of two folds of skin, the parts must be kept dry and separated by folds of lint on which some absorbent and soothing powder has been sprinkled. All local and internal irritants must be removed. An occasional mild purge, and light diet for a day or two, is all that will be necessary in most cases. Whenever the disease is due to poisonous food, the stomach should be at once emptied by an *emetic*. In erythema nodosum, however, quinine alone or combined with some preparation of iron, will be found very useful in preventing the recurrences.

CATARRHAL INFLAMMATION—ECZEMA.

Much contention and not a little confusion have arisen out of the attempts to define what is really meant by catarrhal inflammation of the skin. *Typical* catarrhal inflammation is characterized by a visible serous exudation into the upper layers of the skin, and on its surface. But the exudation may be less than sufficient to bring about this result. There are some cases of inflammation of the skin in which the inflammation is slight, or does not develope to its usual degree, and then there is only just sufficient exudation to cause furfuraceous desquamation of the epidermis, while in others the exudation pours out in enormous quantities, so as to saturate the clothing and dressings of the patient, but the *typical* feature is sero-purulent discharge. In other instances again the inflammatory process may go on to actual suppuration, with the formation of large thick crusts. When the serous exudation is very scanty, that is, when the typical feature is not fully developed, the disease is termed *eczema siccum*. When more copious, so as to give rise to

weeping of the diseased surface, *eczema humidum vel serosum*; and where there is free formation of pus, *eczema pustulosum v. suppuratorium*. We should, if we wish to comprehend all the phenomena of eczema, regard it as a sero-purulent inflammation. It is not advisable to contend for its essentially vesicular characters. The vesicles in eczema are, as it were, mere accidents, in the sense that they depend on the nature of the inflammation, the occurrence of serous exudation, the situation of the disease, the character of the epidermis in the affected parts, and to some extent on the exciting cause, and on the constitutional condition of the patient. It is true that vesicles are the most common manifestations of the early stages of eczema, but they are not more characteristic than the so-called papules or pustules. In some cases the inflammatory effusion is so great that the neighbouring tissue becomes oedematous, especially where there is much loose connective tissue. Oedema of the eyelids and swelling of the face is, indeed, often one of the earliest indications of acute eczema of the face.

ECZEMA may therefore be defined as an inflammation of the skin, with exudation and cell-proliferation into the papillary layer of the cutis and into the rete Malpighii, giving rise to thickening and infiltration of the skin, and the formation of papules, of closely packed vesicles, or of pustules which soon run together, burst and expose an excoriated, reddened surface, discharging a fluid, which dries into yellowish or brownish crusts. Sometimes for days or even weeks before eczema breaks out the skin itches, is dry, harsh, and red, and covered with fine brown scales; or the patient scratches and rubs the part, and determines the outbreak of an acute attack of eczema. Before the discharging stage is reached, there is generally considerable pain, heat, redness, and swelling, in fact all the classical symptoms of inflammation. Fresh crops of vesicles come out from time to time, but sooner or later the discharge diminishes in quantity, the redness gradually fades, and the swelling subsides, leaving a dry reddish patch covered with thin scales, which may speedily disappear, or remain for many weeks or even for months.

It must not be imagined that because it has been stated that a papule may be the initial lesion of eczema, by that term is meant exactly the same thing as a lichenous papule. Lichen is quite distinct and separate from what is ordinarily regarded as eczema in almost every respect—in the nature of the lesion, its seat, its course, and its termination. All that it is intended to imply by the papular stage of eczema, is the effusion of a quantity of serum just sufficient to form a papule, but not enough to produce a vesicle. The true lichen papule remains a papule throughout its course, and is not convertible into a vesicle.

The causes of eczema are constitutional and local, among the former of which may be mentioned dyspepsia, sluggish action of the liver or kidneys, and gout. Anything that irritates the skin locally may produce eczema; the disease is also very apt to occur on the congested skin of legs in which the veins are enlarged and varicose.

In the simplest form it is called *eczema simplex*; but when there is much inflammation and great redness, with heat, swelling, and perhaps also pyrexia, it has been named *eczema rubrum*. Other varieties have been designated according to the seat of the disease, whether on the

scalp, ear, face, hands, nipple, &c. ; but the affection is pathologically the same in every case. It may, however, be remarked that when there is much formation of pus, or when the disease commences with pustules, it has received the special name of *eczema impetiginodes* or *impetigo*. When the patches are dry and covered with thick hard scales, the disease is called *eczema squamosum*. The term *eczema marginatum* has been given by Hebra to a variety which commences on the inner part of the thigh against which the scrotum lies, by a small and circular excoriated patch, which spreads upwards to the abdomen and backwards to the buttocks, but leaves the penis untouched. Eventually the disease may reach the upper part of the chest, by extending at the periphery at the same time that the centre clears. It is a parasitic disease, due to the trichophyton tonsurans. There is, lastly, a not infrequent form of eruption usually regarded as chronic eczema, but which is *probably* parasitic. This is characterized by circular patches, which form especially on the back of the hand and on the forearm. There is not much discharge, and only a little crusting, but the itching is often intense. On examining microscopically the crusts of several of these cases, some of the trichophyton fungus-elements are often found, and it would seem that these cases are really inflamed patches of tinea circinata. It is certain that they readily recover under parasiticide treatment.

When eczema has lasted some time, the skin becomes thickened, infiltrated, and fissured—*eczema rimosum*. The papillæ become enlarged and infiltrated with cells ; and there is also increased pigmentation and staining.

A very obstinate form of eczema occurs in pale, ill-developed, ill-nourished, and lymphatic children. This variety, which may sometimes last a lifetime, is most common on the extremities, especially in the flexures, and is often attended with some superficial ulceration. It gets better and worse from time to time, but is always aggravated by a stormy damp state of the atmosphere, or by any deterioration in the patient's health. Although much may be done by protecting the skin to alleviate the pain and discomfort, the disease itself often remains intractable under all the ordinary forms of treatment, and only gets well after a long course of tonics and alteratives.

TREATMENT.—The treatment of eczema must necessarily vary so much in different cases, that it would be useless to attempt to do more than to give a few general hints on the subject. Every case must be treated on its merits. It may be laid down as a general rule that in the acute stages the skin should be protected and soothed ; later on *astringents* may be used, and when the redness and discharge have subsided, mild *stimulants* and *absorbents* should be carefully employed. The various functions of the body must be attended to, and the free action of the kidneys, liver, and intestines ensured. In the acute stages great benefit will be derived from the administration of *alkaline diuretics*, with occasional small doses of colchicum. All stimulants, such as alcohol, coffee, savoury dishes, and seasoned food should be strictly prohibited as long as there is much inflammation. In weak debilitated persons cod-liver oil, quinine, and iron will prove of great service. Arsenic sometimes answers well in chronic cases, especially where there is much

thickening and scaliness, but in the acute stages this drug should not be employed.

Locally the treatment should vary with the stage of the disease, and the condition of the tissues. When there is great inflammation and copious discharge, warm or cold water-dressings are best, and the diseased surface should be kept clean and free from crusts. If the discharge be hot and irritating, an alkaline lotion containing bicarbonate of soda and borax will afford great relief. An oxide of zinc lotion with prepared calamine, or a weak lead lotion will not unfrequently alleviate the pain, check the discharge, and expedite the cure. If the disease extend over a wide area, the application of carron oil or equal parts of almond oil and lime water will both soothe and protect the surface. When the disease has become sub-acute, a lotion containing two or three grains of chloral hydrate to an ounce of camphor water will sometimes prove a most valuable application. The rapidity of cure in some cases even of long standing has often been quite surprising. It must be observed, however, that the first few applications of the chloral hydrate lotion sometimes cause smarting, which lasts for half an hour or so, but no inconvenience is complained of after the lotion has been used for a few times.

The thickening and infiltration that are so often seen in chronic cases of eczema may generally be removed by the use of a lotion containing one drachm of liquor potassæ to two ounces of water, or by the cautious application of soft soap. Weak preparations of tar will often serve to cure a case that has long resisted all other modes of treatment. An ointment containing five grains of ammoniated mercury and ten grains of precipitated sulphur to an ounce of lard, is very useful in eczema of scalp, face, and hands.

Eczema marginatum must be attacked by parasitocides. For this purpose the strong ammoniated mercury ointment is useful. Glycerine and borax, or a carbolic acid lotion or ointment (from 1 to 12—20 parts), or a hyposulphite of soda lotion will answer equally well. The daily employment of the continuous electric current is very valuable in that form of chronic eczema which occurs in a generally unhealthy state of skin. The *modus operandi* of this therapeutic measure seems to be according to the well-known action of the continuous current on the nutrition of tissues.

BULLOUS INFLAMMATIONS.

Many authorities include under this heading rupiä, ordinary herpes, and pemphigus. But as rupia is always syphilitic, it will be described with the syphilitic diseases of the skin. It would, perhaps, be more correct to regard the bullous diseases as neurotic, but as our information is not yet quite complete, we shall adhere for the present to the more popular clinical classification. It may, however, be remarked that herpetic eruptions always bear some anatomical relation to the distribution of the cutaneous nerves, and in this fact we may look for some elucidation of its pathology. Overwhelming evidence has of late years been adduced to prove that herpes is really due to some change in the nerves. Bärensprung has found in a case of herpes zoster an

irritative overgrowth of cells within the neurilemma of the spinal nerves and their ganglia. Charcot has furnished similar evidence, which has been further confirmed by a case more recently recorded, in which there was an outbreak of frontal herpes when the Gasserian ganglion was involved in a cancerous mass that had spread from the face.

A bulla or herpetic vesicle is produced by the superficial inflammation of the skin, and the rapid exudation of a large quantity of serum into the papillary layer and into the rete Malpighii, causing the formation of a chambered bladder or bleb. The course varies, being either acute or chronic, and the disease is very apt to recur.

Herpes may be defined as an acute, non-contagious disease, which runs a definite course, and in which groups of vesicles appear on a reddened portion of the skin. These groups, which vary much in size, do not come out simultaneously, but follow one another at irregular intervals. The outbreak of an herpetic eruption upon the lips, and on the mucous membrane of the hard and soft palates of patients suffering from certain febrile affections, especially pneumonia and cerebro-spinal meningitis, is generally regarded as a favourable prognostic sign. Herpes may, however, appear on persons previously apparently quite healthy.

The disease is liable to occur at all ages and in both sexes, but it is most common between the ages of twelve and fourteen.

Several varieties have been named according to their seat, as *herpes frontalis*, *facialis*, *labialis*, *preputialis*, while the term *herpes zoster* or *zona*, or *shingles*, is given to the variety which occurs on the trunk. But all these forms are, no doubt, essentially identical.

Herpes usually commences with a pricking, burning pain, which is sometimes severe, and is frequently preceded by fever. In a few hours red points appear on the skin along the course of a particular nerve, and within twenty-four hours a group of clear watery vesicles or small bullæ is seen on the reddened base. The pain now usually subsides, but it may last for days or weeks, or may return long after the eruption has disappeared. The contents of the vesicles soon become turbid, and in a few days dry up into brownish scabs, which fall off in about ten days, leaving little cicatrices, which may or may not remain. The eruption is generally entirely confined to one nerve, and rarely extends far beyond the mesial line of the body, and still more rarely is it found symmetrical or on both sides of the body. Occasionally distressing constitutional symptoms precede the appearance of the vesicles, and in some of the cases where the eruption has appeared on the face, the severity of the preceding symptoms had led to the diagnosis of serious affection within the cranium. But all these symptoms usually subside on the appearance of the vesicles. In some cases where the eruption has followed the course of the ophthalmic division of the fifth, serious and even destructive inflammation of the eyeball has been observed, especially when the nasal branch of the nerve has also been affected.

It frequently happens, especially in the form that occurs on the prepuce or on the dorsum of the penis, that the disease recurs with a degree of periodicity, the intervals varying from a month to a year or more. It has been stated that herpes on the external genitals is always the result of venereal disease, but this is not true. Many chaste persons,

both male and female, are affected with a troublesome form of herpes in these parts. It has occurred to me to meet with two cases in which syphilis was contracted while the patients were suffering from herpes of the penis, and for years afterwards the herpes returned at intervals, apparently quite uninfluenced by the syphilitic taint.

The affection commonly known as *herpes circinatus* is probably always of parasitic origin, and is not, therefore, an herpetic eruption in the sense in which we have been speaking.

TREATMENT.—As herpes is self-limited, the duty of the practitioner is simple. He cannot hope to hasten or retard its progress. If the parts be protected by cotton-wool and some cooling powder, as starch and oxide of zinc, all that is necessary will have been accomplished. Subsequently quinine combined with small doses of iodide of potassium may be found of great benefit, and should the pain recur or never entirely subside, the application of a belladonna plaster or inunction with belladonna ointment will be found useful.

Pemphigus.—In this disease there are large isolated bullæ filled with clear fluid, upon a slightly reddened but not hardened base. The lesion, in fact, resembles an ordinary blister. The cause is very obscure. It occurs on the palms and soles of newly-born children as the result of syphilis, and is then nearly always fatal. It is more common in children than adults, although I have seen a well-marked case in an old man over sixty years of age. Generally the eruption is preceded by ill-health and cachexia, but sometimes the patient is apparently in good health.

The disease commences as a red discoloration, which itches and burns. Upon this a bulla forms, which may from the first acquire its full size, or commence as a small vesicle which rapidly increases in size. At first the bulla is tense, round, or oval, with clear contents, and varies in size from a pea to a hen's egg. In a day or two the contents, as well as the cuticle, become opaque. In cachectic persons the contents are often mixed with blood. In two or three days the bleb bursts, and leaves a moist discharging excoriation, which soon becomes covered with a scab, under which new epidermis forms. For a long time afterwards a pigment-stain, but not a cicatrix, marks the site of the old bulla. Before one set of bullæ has disappeared fresh crops spring up, which are themselves succeeded by others, and so the disease is prolonged for weeks or even months. The *acute* form is most common in children, and usually lasts for a month to six weeks; but the *chronic* form may occur at all ages, and may last for many months. Sometimes only one bulla is present at a time, as in *pemphigus solitarius*. The extremities are the most common seats of the eruption, but it may occur on any part of the trunk.

If the disease be unchecked, the patient loses health and strength, and may ultimately die of marasmus.

In the variety known as *pemphigus foliaceus*, the disease begins as a solitary bulla, or by several small bullæ which unite and spread, until in the course of months they have increased to such an extent that the entire skin presents a flayed appearance. The bullæ of the foliaceous variety differ from those of ordinary pemphigus inasmuch as they are flaccid, and their contents are from the first turbid. In the advanced stage of the disease the surface of the body is covered with thick,

dirty-looking crusts, which consist of dried serum, abortive epidermis, and sebaceous matter. If the crusts are removed, a raw, angry-looking surface is exposed, upon which new cuticle does not form. Sometimes the disease is rapidly fatal. I have had the opportunity of observing two typical cases, both in women, of pemphigus foliaceus in University College Hospital. One of the patients, a woman about thirty years of age, died within a few weeks of admission. The other case was that of an old woman, who left the hospital after about four months' sojourn, greatly relieved. The disease is, however, rare in England, and is commonly fatal.

If the characters of the disease as just described be borne in mind, there will be little difficulty in distinguishing herpes and pemphigus. It may, however, be observed, that whereas herpes, at least herpes zoster, does not, as a rule, occur more than once, pemphigus usually recurs many times.

TREATMENT.—The treatment of pemphigus resolves itself into giving *tonics* and good food. Locally but little can be done beyond protecting the skin by unctuous applications; it has been recommended to puncture the bullæ, and pencil the subjacent tender cutis with a solution of nitrate of silver, ten grains to the ounce, which hardens the surface, and destroys the great sensibility of the exposed skin.

Hydroa.—This eruption, first described by Bazin, and greatly misunderstood by others, consists of minute vesications arising out of irritable red indurated spots, the vesicles soon shrivelling up, and, after the manner of that of a varicellous spot, the induration remaining for a while, and often presenting a central umbilication occupied by a dark scab, marking the site of the original vesicle. There may be few or many spots. In the latter case the eruption is often symmetrical, attacking the shoulders and the limbs, especially the back of the fore-arms. Each spot runs its course in a few days, and the disease, as a whole, is made up of successive crops of isolated vesicated bumps. The disease is often very pruritic. It may last from a week or two to many months. It is apt to recur, and may affect the mucous membrane of the mouth. In some cases the vesicles are mixed with distinct bullæ, like those of pemphigus in many respects. Sometimes they are disposed somewhat after the manner of those of herpes. In fact, the disease is allied in its nature to these neurotic eruptions. Hydroa is confounded by many with herpes iris, and it has been said that it is excited by iodide of potassium, but it mostly occurs independently of the exhibition of this drug, which, as Ricord pointed out years ago, tends, amongst other things, to favour by its stimulation of the skin the development of any impending eruption.

TREATMENT.—This consists in the exhibition of *nervine tonics*; and the local use of *astringent* and *soothing* lotions.

PUSTULAR INFLAMMATIONS.

Pustular skin-diseases include those in which the inflammation proceeds to visible pus-formation as a primary phenomenon. We have already seen that in eczema the exuded fluid may produce a vesicle

which may burst, or which may become purulent by the accumulation of pus-cells within it. And, accepting the modern views of pyogeny, there is little difficulty in understanding that all the so-called catarrhal inflammations may become suppurative; that, in fact, all inflammations are attended with a certain degree of pus-formation. Although, therefore, impetigo and impetigo contagiosa, ecthyma, and furunculus have been classed as suppurative diseases, only the last two can strictly be so called, for the first is merely a phase of eczema, and the second is really a vesicular disease, which may be accompanied by slight suppuration.

One of the affections most commonly known as impetigo is an inflammation of the hair and the sebaceous follicles, and should be so described; whereas the disease generally called impetigo is really the impetigo contagiosa of Dr. Tilbury Fox, which we shall now describe.

Impetigo contagiosa.—If some of the clear fluid from one of the vesicles of this disease be inoculated into a healthy subject, the point of inoculation remains red, and in twenty-four or thirty-six hours a minute vesicle forms, preceded and accompanied by severe and almost intolerable itching. If the cuticle be not ruptured, the vesicle increases in size, and the contents become sero-purulent, in two or three days drying up into a flat straw-coloured scab, under which new epidermis forms, and the disease rapidly passes off. But as seen in patients the eruption is somewhat different, for it is often preceded by a little constitutional disturbance, and the vesicles, which generally appear first on the face, may extend to the trunk, but usually remain isolated. The fingers may become inoculated by scratching, and in turn convey the poison to other parts of the body. Sometimes the disease appears to be epidemic, and affects the whole body like one of the acute specific diseases, with the exception that it usually takes a week or more for the body to become so extensively involved. It is most commonly met with in children, but not infrequently affects adults. The nature of the poison is unknown, although some observers have supposed it to be a minute fungus which they have discovered in the scabs, but it is difficult to imagine that the fungus, which is met with in the crusts, but which cannot be found in the clear fluid when it is most inoculative, should be the agent of contagion.

TREATMENT.—The scabs should be removed by poultices or by oil, the hair being cut short if necessary, and an ointment composed of ten grains of ammoniated mercury to an ounce of lard applied to the raw surfaces. This will serve to cure the disease in a few days.

Ecthyma.—In this disease the pustules are seated on an elevated, reddened, and indurated base. The suppuration rarely affects the tissue of the true skin, but is confined to its surface. If the true skin be affected, and ulceration take place, a cicatrix will result, but usually only a red mark remains, which in time clears off.

An ecthymatous eruption may be produced by the local application of tartar emetic ointment. The disease may also be produced by anything that irritates the skin, especially in cachectic subjects, and it is a common complication of scabies in children, and of phtheiriasis in adults. It is sometimes met with during the course of febrile diseases; and may occur without any apparent cause in ill-nourished and debilitated persons.

The inflammation which precedes the formation of the pustule is sometimes attended by constitutional disturbance, fever, and a good deal of shooting pain. The pustules themselves are isolated and surrounded by a broad red areola, being seen most commonly on the extremities and buttocks, but sometimes on the trunk. The pustules are large, being about the size of a split-pea, or even much larger, and their contents often become mixed with blood. The contents soon dry up into brownish scabs, which fall off in from ten to fourteen days, leaving behind red spots covered with new epidermis. Sometimes, however, suppuration continues beneath the crust, and as a result of the ulceration which takes place in the upper layer of the cutis, a permanent cicatrix results. There are two chief varieties of ecthyma—the *acute* and *chronic*. The former is generally accompanied by severe constitutional symptoms.

TREATMENT.—Remove local causes, such as scabies; apply *astringents*, as subacetate of lead ointment, zinc, or lead lotion; and give *tonics* and good food.

PAPULAR INFLAMMATIONS.

In the diseases included under this heading the inflammation is accompanied by serous exudation into the papillæ and rete Malpighii, with more or less cell-proliferation and increased production of the epidermis, which give rise to the formation of papules and thickening of the skin. The diseases comprised in this class are *lichen* and *prurigo*. These complaints are for the most part constitutional in their origin, and require general treatment. They are usually chronic, and are very apt to recur.

Lichen.—In this disease there is an inflammation of the skin, in which the exudation and the new tissue form little solid elevations or *papules*. There is also some exudation into the rete Malpighii of the epidermis, which causes fine desquamation when the disease resolves. The exciting causes are very obscure. The disease is frequently seen in strumous persons, but generally the subjects are tolerably healthy.

Lichen simplex is characterized by little papules of a pale-red colour, which do not disappear, but become paler on pressure. The skin generally feels dry and thickened. There is usually some itching and tingling, but sometimes no annoyance whatever is experienced. The most common seats are the back of the hands and forearm, the neck, and the thigh. The papules disappear in a week or two, and the disease terminates by desquamation of the cuticle. Sometimes, however, it becomes chronic, and may last for weeks or months. The disease may occur in circular patches, which fade in the centre as fresh papules form at the margin, giving rise to the appearance known as *lichen circumscriptus*, and when several of these patches unite *lichen gyratus* results. *Lichen lividus* is really purpura, and *lichen urticatus* has already been described as a papular form of urticaria. In *lichen agrius* the appearance of the papules is accompanied by severe inflammation, and almost intolerable itching and burning. The patches are scratched and excoriated, and pour out a serous exudation, by which

the disease is made to resemble eczema. In *lichen pilaris* the papule is situated at a hair-follicle, and the disease is characterized by the passage of a hair through the centre of the papule, which consists of dried serous exudation and epidermic accumulation.

Hebra has described a variety of lichen, which he has designated *lichen exudativus ruber*, and which seems to be an aggravated form of the *lichen planus* of Mr. Erasmus Wilson. In this disease there is an enlargement of the root-sheath at the lower part of the hair-follicle, which becomes expanded into little finger-like projections. The upper part of the sheath is also greatly hypertrophied, and presents an infundibular appearance with the base upwards. The disease shows itself externally as small, isolated, pale-red papules with flat tops, covered with fine, silvery scales. Larger or smaller patches are formed by the development of fresh intermediary papules, and not by a peripheral extension of the old ones. The disease spreads till it affects a whole region, or even the entire body. The appearance is then quite characteristic. The integument is harsh, dry, thickened, reddened, and covered with fine, silvery, epidermic scales, which differ, however, from those of psoriasis. The affection is very chronic and apt to recur. For many weeks or even months after the subsidence of the papules and thickening, deeply pigmented, atrophied depressions may be seen on the skin. The staining is often more marked and more persistent than that of syphilitic eruptions. The most common seats of the disease are the upper limbs, especially the flexor aspects of the wrist and forearm, and the front of the legs. The patients are, as a rule, pale and out of health, not infrequently suffering from the effects of over-work and worry. It is stated that sometimes the disease terminates fatally.

Lichen scrofulosorum is the name given by Hebra to a disease that is rare in this country. The affection, which is most frequent in children, is characterized by the appearance of small papules of a dark red colour, occurring in crescentic or circular groups. The papules are situated at the mouth of the hair-follicles, and are covered with epidermic scales, which may be readily removed. The disease may show itself on any part of the body, but is most common on the back, abdomen, and chest, more rarely being observed on the extremities, and it is often associated with pustules, as well as with the ordinary manifestations of a strumous constitution. Although the papules frequently disappear of themselves, they are liable to recur again and again. Cicatrices generally mark the seat of the papules.

TREATMENT.—In the acute stages soothing applications, such as gentle frictions or packings with oil, must be used; and the general health must be treated according to the indications present in any individual case. Should the disease become chronic, some stimulating application will be necessary, as carbolic acid, tar, or some of the mercurial preparations. Internally *tonics* or *alteratives*, combined with some preparation of arsenic, must be given for a long time. Cod-liver oil will be necessary in the scrofulous forms.

Prurigo.—The papules met with in this disease are produced by serous exudation and cell-proliferation into and within the papillæ and

the rete Malpighii; but the whole of the epidermic layer is, moreover, greatly hypertrophied. The exciting cause is not known, but the disease is rare in childhood, and is more common in men than women. The disease called *prurigo senilis*, which is really only the congestion of the papillæ and follicles of the skin produced by the irritation of scratching or of pediculi, etc., is not a true prurigo, and will, therefore, be considered under phtheiriasis. On the other hand, it must not be forgotten that the presence of any local irritant will aggravate true prurigo.

The disease is characterized by the presence of slightly elevated, broad papules, which are of the colour of the skin. Many of the papules cannot be seen, but may be readily felt by passing the finger over the skin. There is always intense itching, which is made worse by anything which irritates the skin. By scratching to allay the itching the tops of the papules are torn off, and become covered with little blood-crusts. When the affection has lasted a long time, the skin becomes thickened, darkly pigmented, and perhaps studded with large pustules. Sometimes there is a sensation of formication, hence the name *prurigo formicans*. When the disease is mild it is called *prurigo mitis*; and when severe, *prurigo ferox*, which is said by some to be incurable. It is rarely curable in adults, but in children the prognosis is more hopeful.

The most common seats of prurigo are the shoulders, the neck, the outer aspects of the arms and legs, and the buttocks.

TREATMENT.—Anything that is likely to aggravate the symptoms should be avoided, and soothing applications, *anodynes*, and *sedatives* should be applied. The itching may often be allayed by an alkaline lotion combined with hydrocyanic acid; or in some cases by a solution of carbolic acid (1 to 20 or 1 to 40). Applications of mild preparations of tar are often of service, and great benefit may frequently be derived from the use of a lotion containing about one-tenth to one-third of a grain of perchloride of mercury to an ounce of water. The effect will, however, be greater if some bismuth and oxide of zinc powder be combined with the mercury. Some practitioners recommend the application of sulphur with or without tar; others prefer soft soap.

Tonics, such as cod-liver oil, quinine, and iron, will be required in the later stages. A few cases, moreover, will be benefited by a course of arsenic.

SQUAMOUS INFLAMMATIONS.

In the diseases which belong to this class the inflammation is accompanied by increased formation of epidermis. Although we include under this head *pityriasis rubra* and *psoriasis*, the two diseases are very different. In the former there is a *desquamation* of the infiltrated cuticle from the whole body; and in the latter a *hyperplasia* of epidermis in certain regions, as a result of the increased vascularity of the hypertrophied papillary layer of the skin. The former, moreover, is a general disease, accompanied by constitutional symptoms, and may eventually terminate fatally; whereas the latter is rarely attended with

any symptoms referable to the general system. Both are, however, liable to recur.

Psoriasis.—The epidermic formation in psoriasis is considerably increased as a result of enlargement of the papillæ and their capillaries. The papillæ are themselves the seat of cell-proliferation and infiltration. The collections of epidermis vary much in size, from a minute point to extensive areas occupying many inches of surface. The favourite seats are the elbows and knees, from which the disease gradually spreads, keeping for the most part on the extensor aspect of the limbs. Next in frequency are the scalp, face, and trunk, and more rarely the nails. The disease is often hereditary, but may occur in healthy persons, especially if they have become temporarily debilitated.

It would almost appear that in some instances psoriasis is strictly and literally a disease of the skin, due solely and entirely to some perverted state of the nutrition of certain areas of the cutaneous tissues, and altogether independent of the general system. This is more particularly the case in some of the hereditary forms—the disease continuing for years uninfluenced by any conditions of health, or by treatment. But this is not always the case, for psoriasis is very prone to be transmitted in scrofulous and gouty families, and in these instances the state of health does affect very materially the skin-affection. In gouty subjects, for instance, outbreaks of psoriasis may alternate with ordinary attacks of gout, and sometimes the skin-disease may be made to disappear by remedies that relieve or remove the other gouty symptoms. Particular kinds of diet seem to start the disease in some persons, or at all events it may sometimes be cured by changes in the diet. Dr. Passavant of Frankfort, and the late Dr. Parkes of Netley, whose valuable and intelligent labours have done so much to advance the art and science of medicine, have each observed chronic psoriasis rapidly disappear when the patient was placed on a meat diet, although every other mode of treatment had previously failed.

Psoriasis is characterized by the appearance of dusky-red or coppery, slightly elevated patches, covered with white silvery scales. At first the spots are minute, as in *psoriasis punctata*; they then increase in size, and the disease is called *psoriasis guttata*; when they are still larger, *psoriasis nummularis*; when very extensive, *psoriasis diffusa*; and when they consist of rings, *psoriasis circinata* or *lepra*, which is merely an advanced, or it may be a healing stage of psoriasis, and from which it does not essentially differ. When adjoining rings coalesce, they cease to extend in that direction, and from the odd figures sometimes thus produced, this variety has been called *psoriasis gyrata*.

Another variety, of fairly common occurrence, has been termed by Dr. McCall Anderson *psoriasis rupioides*. In this form, which occurs most frequently on the chest, the scales are collected into rupioid crusts. The disease is not essentially syphilitic, although it may occur in syphilitic or strumous persons. If the crust be torn off, and the lower layers examined under the microscope, they will be found to be crowded with leucocytes and abortive epidermic cells,

The base from which the crust is detached is often raw and very vascular.

When psoriasis has lasted a long time, the structure of the skin becomes altered, the elements of the true skin being replaced by fibroid tissue, so that the integument is thickened and indurated, harsh, dry, and fissured.

TREATMENT.—In the acute and congestive stages soothing applications, such as water dressing, oil, or alkaline baths answer best. Later on, when only thickening and scaliness remain, some preparation of tar will be found useful. As regards the general treatment, the kidneys and liver should be made to act freely, and when the congestive stage has passed, *tonics* may be prescribed. Cod-liver oil should of course be given to strumous patients, and an occasional course of alkaline colchicum mixture may often expedite the cure in gouty subjects. In chronic cases, especially where there is an excessive formation of epidermis and thickening of the skin generally, some preparation of arsenic should be given. If the subjects be anæmic, steel wine and the arsenical solution answer well; but if there be no anæmia, the arseniate of soda combined with gentian and bicarbonate of soda may be found to answer better, especially if there be a tendency to chronic gastric catarrh. But it must be borne in mind that whenever arsenic is given, it should be continued for a long time in gradually increasing doses. The fact that the arsenic produces irritation of the mucous membrane is not of itself an indication to discontinue the remedy. To ensure a cure, the drug must be continued for at least six weeks after all traces of the complaint have disappeared.

Pityriasis simplex consists of a slight superficial inflammation of the skin, followed by a furfuraceous desquamation, and is generally of an eczematous nature. The scalp is its common seat. This is altogether different from the disease which Hebra has described as *pityriasis rubra*, which, although not common in England, is sufficiently frequent and important to merit some consideration here.

TREATMENT.—Oily and astringent applications cure the simple form.

Pityriasis rubra, first accurately described by Devergie, is an acute general superficial inflammation of the skin, which may begin in any part, but *which extends over the whole body within a few weeks*. The cutis is intensely red, congested, and swollen; and the cuticle, which is greatly increased in quantity, flakes off in large masses. The desquamated cuticle is mixed with a certain amount of exudation-matter, which is, however, never sufficient to cause more than mere moisture. The disease occurs in debilitated persons, is very liable to recur, and is, in fact, said to be ultimately fatal. The temperature is not, as a rule, elevated, but it may be, though probably only as an accidental manifestation in the course of the disease. The phenomena observed in this disease seem to point to some change in the sympathetic nervous system. When the case is progressing towards a cure, the cutis becomes less red and swollen, the desquamation diminishes, and finally the skin resumes its normal appearance. Sometimes, however, the affection becomes chronic.

TREATMENT.—The patient should be rubbed with oil, and wrapped up in bandages soaked in oil, to remove the scales, and to keep the

skin soft and supple. Internally, *tonics* and cod-liver oil are necessary. Arsenic is scarcely desirable; in fact a man came into University College Hospital, a few years ago, in whom an attack of pityriasis rubra supervened while he was under the influence of arsenic, for some small patches of psoriasis.

DIATHETIC DISEASES.

By this term we understand diseases that are dependent on certain persistent morbid dispositions of the body, which modify to a greater or less extent all the nutritive processes. For the present we shall describe, very briefly, the syphilitic eruptions only.

Syphilitic Skin-eruptions vary according as the patient is the subject of hereditary or acquired syphilis.

Hereditary Syphilis.—The eruptions in this variety usually show themselves when the child is a month or six weeks old, but may be deferred for several months. In addition to the marasmus and other general symptoms of hereditary syphilis already described, the child becomes affected with mucous tubercles, condylomata, and fissures about the mouth and anus, while dull erythematous rashes, which may or may not become tubercular, appear about the palms and the soles, but especially on the buttocks. Sometimes bullæ and pustules, accompanied by deep ulceration, appear, especially on the hands and feet. So-called syphilitic pemphigus is very frequently fatal in young children. Even in boys and girls and young adults, papular, pustular, and gummatous eruptions may show themselves as a result of hereditary syphilis.

Acquired Syphilis.—The actual nature of the eruption will vary according to the stage of the disease. The first cutaneous manifestation after the initial lesion is *roseola*, which occurs chiefly on the trunk, and consists of coppery, non-elevated spots, which leave behind dark stains or *maculae*, which may last for weeks. Next come the *papular syphilides*, in which there is a deposit of granulation-tissue. If the patches are still larger they are called *tubercular syphilides*, which frequently assume circular, serpiginous, or crescentic forms. About the same period the hair falls out, and often the nails become affected.

Vesicular syphilides are rare, but are sometimes seen. *Rupia* is a bullous disease, and is always syphilitic. The bulla forms like that of pemphigus, but instead of the crust falling off, it remains attached, while the ulceration extends under it and forms another layer. This goes on until several layers are formed, each one being larger than that above, hence the cockle-shell shaped crusts which are said to be characteristic of this disease. If the scab be removed, a grey sloughy-looking ulcer will be exposed. It should not, however, be forgotten that the typical rupia-crust may often be seen in cases where there is not the least evidence of a primary bullous stage. Exactly the same appearance may result from the ulceration of tubercular syphilides. In fact, it may be alleged that if rupia be regarded as essentially a bullous affection, it is very rare, whereas rupia-like ulcerations are very common

in syphilis. The so-called *pustular syphilides* are usually due to the suppuration which takes place around the syphilitic deposit in the walls of the follicles, in the disease known as *syphilitic acne*. The *squamous syphilides*, which have been called *syphilitic psoriasis*, differ from true psoriasis inasmuch as the scaling in syphilis is the result of a deposit in the true skin, which disturbs the epidermic formation and really causes desquamation. It will be found, moreover, that the squamous syphilides rarely affect the seat of ordinary psoriasis. A squamous syphilide is very common on the palms and soles, the desquamation always being preceded by a deposit of morbid tissue in the cutis. The particular seat of the syphilide will often be determined by some local irritation, the disease showing itself perhaps only on those parts of the hand or foot that are more pressed upon in work or in walking. In the later stages of syphilis, true *gummata* may be developed in and beneath the skin. These give rise to large, prominent, coppery, tubercular masses, which readily break down and ulcerate. It will, however, generally be found that the amount of true skin destroyed by this ulceration is much less than had been anticipated, the ulceration really resulting from a destruction of the gummatous matter, the true tissue being removed rather by the pressure exerted by this deposit than by actual ulceration. Syphilitic skin-eruptions are rarely attended with itching when fully developed, but it is not uncommon to find severe itching when the eruption is first appearing. All the eruptions are, moreover, followed by deep, dusky-red staining, which may remain for months or even years after all sign of deposit has disappeared. By observing the general characters of the eruption, and paying attention to the history, there will be no difficulty in establishing a diagnosis.

TREATMENT.—The treatment of syphilitic skin-affections must, to a large extent, be the same as that for the other manifestations of syphilis, but there are some differences which should be observed. Mercury should always be given in the early stages, and it is, as a rule, better to avoid iodide of potassium or the combinations of mercury and iodide of potassium which are so frequently prescribed. Good very rarely comes of such treatment, and it is not always free from harm. The next question is as to the form of mercury to be administered. It will be found that the milder and less stable preparations of mercury are most effectual for skin-diseases. Chalk and mercury powder, calomel, or blue pill in small and frequently repeated doses will be found to act better on the skin than the perchloride of mercury, which in the writer's experience has proved of little value. Two grains of chalk and mercury powder, with two or three grains of compound ipecacuanha powder, repeated two or three times a day until the gums begin to become red, will be found a safe and trustworthy means of treating all of the earlier and many of the later syphilides. To eradicate the disease, or to prevent relapse, the remedy must be persevered in for from six months to two years, according to circumstances. To avoid the irritation of the gastric and intestinal mucous membranes which sometimes occurs when patients have taken mercury internally for a long time, it will be well to omit the medicine for a day or two every two or three weeks, and to administer a saline purge to clear the bowels. So-called palmar psoriasis should always be

treated with mercury, iodide of potassium being in the vast majority of cases quite useless even in the largest doses long-continued.

It is very important in treating syphilis to combine *tonics*, such as cod-liver oil, quinine, and iron, which will sometimes serve to dispel an eruption, or will at least greatly facilitate the action of the proper syphilitic remedies. In the later stages of syphilis more reliance may be placed on iodide of potassium, which may in fact be trusted to remove the gummatous deposits. It is well to combine ammonia and iron with the iodide of potassium. Locally, mercurial vapour or inunctions will be found of great service. The sloughy-looking ulcers are best treated with the iodide of starch paste or iodoform, which cleanses the sores and facilitates the reparative action.

HYPERTROPHIES AND ATROPHIES.

In this class are included those diseases which are characterized by an increase or diminution in the size or in the quantity of the normal elements of the skin. This class is therefore a large one, but we shall consider only *ichthyosis* and its modified form *xeroderma*, *elephantiasis arabum*, *keloid*, and *fibroma*.

Ichthyosis and Xeroderma.—In these diseases the papillary layer of the skin and the epidermis are greatly hypertrophied, while the sebaceous follicles are small in size and few in number, so that the skin is not softened and lubricated by the fatty sebum. When there is a large accumulation of epidermis the disease is called *ichthyosis*; but when the skin is merely roughened, without any marked collection of the epidermis, it is termed *xeroderma*.

The disease is characterized by a dry, roughened condition of the skin of the whole body, which is congenital, or comes on within the first or second year, and lasts throughout life. The patient is subject to eczematous eruptions in the flexures. When the skin is well protected and the weather mild, there is very little annoyance, but if the skin be irritated, as in windy and damp weather, it cracks and desquamates, and becomes very tender and inflamed.

TREATMENT.—Although this complaint is, strictly speaking, incurable, much may be done to relieve the patient's distress by oiling the skin and keeping it supple. No internal remedies are of any special avail. The skin is always best when the patient's health is good.

Under the head of hypertrophies should be placed **tylosis** or the callosity that arises from pressure, as on the hands of workmen and on the feet. **Clavus** or corn is a conical-shaped hypertrophy of the cuticle, the apex of which presses on the tender and generally atrophied cutis; and **verruca** or wart is an hypertrophy of the papillæ, covered by a thick layer of the cuticle. But these affections come more strictly under the care of the surgeon.

Of the same nature is the disease that has been termed **Elephantiasis Arabum**, which consists of enormous hypertrophy of the elements of the skin, and of the subcutaneous cellular tissue. The disease is the result of inflammation and obstruction in the lymphatic vessels, hypertrophy of the elements of the skin soon following, and

the parts become hard, brawny, rough, discoloured, and prone to ulcerate. In time the whole thickness of the tissues down to the bones may become involved. The disease is, however, rare in England, and is only amenable to surgical treatment.

Keloid consists of a localized hypertrophy of the fibrous tissue of the skin. The disease is *idiopathic* or *traumatic*. The *idiopathic* variety commences as a small, elevated, hardened mass, which is at first pale; but soon becomes pinkish and shining, and sends out offshoots like claws, which contract and produce great deformity. The most common seat is the sternum, but the disease is by no means confined to that part. The *traumatic* variety results from an unusually active growth of the cicatricial tissue closing a wound. It may therefore occur on any part of the skin that has been wounded, injured, or ulcerated; nor need the lesion have been severe. The appearance it presents is that of a slightly-elevated, hard, and red tubercle, with or without processes, extending into the surrounding tissue.

TREATMENT.—Very little can be done, but some cases have been cured by pressure. Caustics and the knife are of doubtful value, because the disease is prone to recur in the scar of the wound.

Molluscum fibrosum or **fibroma** consists of sessile or pedunculated tumours, formed by the circumscribed hypertrophy of all the elements of the skin. They are of the colour of the true skin, and never contract as in keloid. When taken between the fingers, the tumours have a peculiar soft feel, allowing of the inner surfaces of the two sides to glide over one another. They may occur on any part of the body except the palms and the soles, and may exist in great numbers. They do not cause any pain, except when they become accidentally injured or inflamed.

TREATMENT.—Nothing short of surgical interference is of any avail.

Atrophy.—Loss of hair is one of the most important of the atrophic affections of the external integument, but this properly belongs to diseases of the hair and hair-follicles. Sir James Paget has shown in his admirable lectures on Surgical Pathology that any constant pressure will cause atrophy, while intermittent pressure causes hypertrophy. In accordance with this pathological law, callosities of cuticle may occur as the result of intermittent pressure, but atrophy of the elements of the cutis will follow from the constant pressure of this hard, thick cuticle. In old age, too, the skin becomes atrophied, the fat is absorbed, the fibrous tissue becomes broken up and granular, the elastic fibres shrink or disappear, the follicles diminish in size and number, and the hairs fall out, so that the skin is thin, dry, harsh, inelastic, wrinkled and shrunken, and more or less bald.

NEW FORMATIONS.

Under this heading are included the heterogeneous neoplasmata of the skin, namely, *cancer*, *lupus*, and *rodent ulcer*. These diseases are all chronic, and the newly-formed tissue has a constant tendency to spread, ulcerate, and ultimately to destroy life. As cancer and rodent ulcer are essentially surgical diseases, that is, always require surgical

aid, we need only discuss lupus, cases of which are more likely to come under the care of the physician.

Lupus.—This depends upon a deposit in the corium of what Virchow has termed “granulation-tissue,” the elements consisting of cells like those of the Malpighian layer of the skin. The granulation-tissue is found in every element of the skin, the rete Malpighii, papillæ, fibrous tissue, the walls of the follicles, and in the subcutaneous cellular tissue. The shape, size, and extent of the growth has given birth to names expressive of varieties, but in all cases the nature of the disease is the same. If the neoplasm do not ulcerate it is called *lupus non-exedens*; but if ulceration occur, *lupus exedens*. There is another variety which has been called *lupus erythematodes*, in which the disease begins in the walls of the sebaceous follicles and in the adjacent tissue. It then spreads superficially at the periphery, while it heals in the centre. The patches are studded with white or greenish points of sebum, which project from the diseased follicles, but there is never deep ulceration. When the disease subsides, it leaves a thin shining cicatrix.

Lupus is rare before the tenth and after the thirtieth year, but is often seen early in life in scrofulous persons. The most common seat is the face, especially the nose and the cheeks, but it may occur on the buttocks, extremities, and, more rarely, on the trunk. The tissues most liable to become affected are the cartilaginous and the fibrous, and the mucous membranes. The disease commences as small, softish, red, and vascular nodules, which are not at all painful. In time the nodules increase in size and extent, and become covered with white scales of detached epidermis. After remaining for a varying period of time, the growth may undergo fatty degeneration and become absorbed, leaving a superficial or depressed scar, according to the degree of deposit—*lupus non-exedens*; or the growth may spread and become extensively and deeply ulcerated, producing unsightly deformities, and even destroying whole organs—*lupus exedens*.

TREATMENT.—The general treatment consists in *tonics* and good living. Cod-liver oil is very valuable in cases of lupus, and often serves for a cure without any local application. If the disease have ceased to spread, and there be not much vascularity, small doses of iodide of potassium are useful, and assist in the absorption of the morbid tissue. Locally, if the parts be irritated, inflamed, and swollen, soothing applications, such as oxide of zinc and liquor plumbi should be used. A very useful application is oxide of zinc and starch powder, in the proportion of three drachms of the former to one ounce of the latter. Powdered French chalk may be used. These preparations are capable of taking up a large quantity of moisture, and therefore dry up and cause contraction of the swollen tissues.

When lupus has ceased to spread, *caustics* may be applied to destroy the growth. For this purpose the galvanic cautery is, perhaps, the best. After this come the actual cautery, acid nitrate of mercury, and arsenical paste. If caustics be applied too early, there will be great risk of causing the disease to spread. Whenever there is a tendency to morbid growth, irritation of the tissues by any means whatever will stimulate them, and thus increase the deposit.

PIGMENTARY CHANGES.

We shall describe but briefly the various pigmentary changes of the skin. They are simple, and are not attended with pain or discomfort, beyond the annoyance they sometimes give to the delicate and sensitive feelings of females. All these affections are dependent on an increase in the quantity of the pigment of the skin. Sometimes the coloration is congenital, as in moles; but it is far more frequently acquired from irritation of the skin, or exposure to heat and sun. There are also what may be called pathological and physiological pigmentations of the skin, the former being seen in Addison's disease and certain cachexiæ; the latter in pregnancy, or even in women suffering from uterine affections. *Chloasma uterinum* is very common on the face of women, and rarely entirely disappears, although it becomes much fainter when gestation is over.

TREATMENT.—To remove the causes will often serve to cure the disease.

The *neurotic* affections of the skin may be omitted, as belonging to the domain of the general physician and surgeon.

PARASITIC DISEASES.

This class includes all the effects produced by the various animal and vegetable parasites that infest the human skin. We shall, therefore, have to describe first the *dermatozoic* affections; and secondly, the *dermatophytic*.

1. *Dermatozoic*.—In these diseases some animal parasite inhabits the skin, and lives thereon. In describing the effects produced, it is well to distinguish between the *essential* and the *accidental* features of the malady. For instance, scabies is sometimes described as being a disease in which papules, vesicles, and pustules occur in certain situations; whereas the essential feature of the disease is the presence of the acarus in a cuniculus.

The skin-diseases due to animal parasites are:—1. *Phtheiriasis*; (*a*) *pediculus capitis*; (*b*) *pediculus corporis*; (*c*) *pediculus pubis*. 2. *Scabies*, *acarus scabiei*. 3. *Morsus*, *pulicis*, *cimicis*. 4. *Folliculitis*, *acarus folliculorum*.

Phtheiriasis is the condition characterized by the presence of pediculi on the body. At least three kinds of pediculi infest the human body, the *pediculus capitis*, the *pediculus corporis*, and the *pediculus pubis* or crab-louse. It is not necessary to describe these well-known varieties.

The *pediculus capitis* inhabits the hairy scalp, and by the irritation it produces may give rise to impetigo, with consequent enlargement of the glands in the neck. The *pediculus corporis* infests the trunk and clothes of persons, especially of those somewhat advanced in years. The real habitat of the *pediculus corporis* is the clothes, especially the seams and folds, so that the irritation of the skin will always be found worse

on those parts of the body where the clothes press, as at the shoulders and the waist. The characteristic lesion, as pointed out by Dr. Tilbury Fox, is a small depressed hæmorrhagic spot, which is, however, *not* on the surface of the skin, but in the mouth of a follicle. This is produced by a small quantity of blood escaping into the follicle, when the pediculus withdraws its proboscis out of the follicle from which it has been sucking. As a secondary result of the irritation and scratching, the follicles of the skin become much congested and swollen, little papules form, and the skin becomes more or less deeply pigmented; hence arises the disease known as *prurigo senilis*. The *pediculus pubis* is mostly found in the hair about the pubes, but may be met with in other parts of the trunk, and even on the limbs and eyebrows, but not, so far as is known, on the head.

TREATMENT.—Mercurial lotions or ointments must be applied to the skin. A clean and effectual application consists of two grains of perchloride of mercury to an ounce of dilute acetic acid, which not only destroys the pediculi, but dissolves the *nits* which are formed on the hairs. The clothes must be disinfected, or the disease will recur.

In order to ensure the destruction of the nits, the clothes should be heated up to at least 200° F. Many other applications, such as staphisagria, sabadilla, carbolic acid, chloroform, &c., are recommended for the destruction of pediculi.

Scabies is a disease due to the presence of the *acarus scabiei* under the epidermis. The female insect bores obliquely through the upper layers of the epidermis, under which she deposits her eggs. She then tunnels her way under the epidermis, forming fine semicircular furrows or *cuniculi*, which she fills with eggs. The male, which is distinguished from the female by being smaller and possessing suckers on the posterior pair of the hind legs, does not make these little furrows. At the point where the insect rests a little vesicle may be seen, from which the *cuniculus* extends. As a result of scratching and irritation, papules, vesicles, and pustules form, and the skin becomes excoriated and disfigured with large *ecthymatous* pustules. There is considerable itching, which is worse when the patient is warm, especially in bed. The disease is most commonly seen in the delicate skin between the fingers and toes, and extends up the limbs, but chiefly on the flexor aspects. It occurs, also, on the penis, mamma, and even on the face. In babies it is most common on the buttocks, the *acarus* being transferred to this part from the hands of the nurse.

TREATMENT.—Sulphur-baths or inunctions, or the application of styrax, will soon effect a cure, but care should be taken not to keep up the treatment too long, lest *eczema* be induced.

2. *Dermatophytic* diseases are those characterized by the presence of vegetable fungi in, or upon the epidermis. They include *Tinea tonsurans*, *Tinea circinata*, *Tinea sycosis*, *Tinea kerion*, *Tinea versicolor*, *Tinea favosa*, and, according to some authorities, *Tinea decatvans*.

Tinea is due to the growth upon the skin of a vegetable fungus, the *trichophyton*, which produces ring-worm, and may be taken as a type of the vegetable parasites of the skin. It consists of oval transparent spores, or more properly *conidia*, many of which are isolated, while others unite and constitute jointed filaments. The fungus, when it

attacks the scalp, inhabits the hairs and their sheaths, but it also grows amongst the epidermis of the scalp and other parts of the body. When the hairs are affected they swell up, become paler in colour and opaque, and lose their elasticity, breaking off close to the surface of the skin. The hair splits up, and the cortical portion and even the cylinder are found full of sporules and mycelia. The effects of the fungus vary according as it occurs on the body, or on either the beard or scalp.

a. Tinea circinata, or ringworm on the body, commences as a small, circular, pale, elevated spot, of the size of a split pea or larger, which is covered with fine scales, and is attended by great itching. As the spot increases in size the centre clears, and the patch becomes a ring, which may extend till it attains a diameter of three or four or more inches. It may occur on any part of the body, but is more common in those parts which are more freely exposed to the contact of the fungus, as the face, neck, back of hands, or wrist.

b. Tinea sycosis, or ringworm of the beard, begins as *Tinea circinata*, but soon the fungus invades the hairs and the hair-follicles. The hairs break off short, and are filled with fungus; while the adjacent tissue becomes swollen and indurated. This disease is very rare in England, very few unequivocal cases having been recorded.

c. Tinea tonsurans, or ringworm of the head, is met with chiefly in children. The disease is characterized by little rounded patches of various sizes, from which the hairs break off, and which are covered by a furfuraceous scaliness. The patches are studded with short stumps of pale hairs, which are dry, brittle, lustreless, mostly opaque, and split and frayed out.

If by any means the patch of ringworm becomes inflamed, the tissue surrounding the hair becomes swollen and granular, the hairs fall out, and the follicles pour out a viscid secretion. This condition constitutes what has been called *Tinea kerion*.

d. Tinea versicolor, or *Pityriasis versicolor*, as it is sometimes called, is the peculiar fawn-coloured furfuraceous scaliness of the skin, which is due to the presence of the fungus known as the *Microsporon furfur*, consisting of fine curved branched filaments, and large collections of conidia. The favourite seat of the fungus is the front of the chest, but it may extend to other parts of the body. It is stated to be especially common in phthisical persons, and is undoubtedly contagious.

e. Tinea favosa is seldom seen in England, and occurs mostly in young ill-nourished children. This disease is characterized by the presence of yellow cup-shaped crusts, which may be separated or united into large masses. The fungus of which the scabs are composed is the *Achorion Schönleinii*. The disease begins in the inner root-sheath of the hair-follicle, from which it spreads, and is usually accompanied by deep ulceration of the skin. Under the microscope the fungus consists, for the most part, of little rounded or oval bodies of about $\frac{1}{300}$ th of an inch in diameter; and of tubes branched, empty, and granular, simple and jointed.

The crusts possess a peculiar odour, which has been compared to the smell of the urine of a cat, or of a cage in which mice have been kept. Although the hairy scalp is the most frequent seat of tinea

favosa, it may occur on other parts of the body, as the face, arm, and neck.

f. Tinea decalvans.—The disease commonly known by this name, but more correctly called *Alopecia areata*, has for long been regarded as a parasitic disease, due to the *Microsporon Audouini*, but the evidence of its parasitic nature is entirely wanting, the best observers having failed to find any plant. The affection is characterized by smooth, shining, bald patches on the scalp. The roots of the hairs are atrophied, and the hairs readily fall out. The alopecia appears to be due to a mal-nutrition of the skin of certain parts. Generally the hairs grow again. Numerous cases have been recorded to show the contagious nature of this disease, but no one has ever satisfactorily demonstrated the fungus, and it is certain that in the majority of the cases designated *tinea decalvans* no fungus can be found. It is possible, however, that two diseases have been confounded, one in which fungus does exist; and another, which is the more common, in which the morbid condition consists in atrophy of the root of the hairs, due to some want of nutrition.

TREATMENT.—To treat dermatophytic diseases, we should pluck out the diseased hairs, and clean the patches by rubbing in soft soap, and then apply some parasiticide, such as equal parts of sulphurous acid and glycerin; or one part of carbolic acid to three, four, or even ten parts of glycerin. The perchloride of mercury lotion recommended for pediculi is also useful. When the patches are inflamed, soothing applications are best. For *tinea decalvans* *rubefaciens* are necessary, I prefer the application of mustard leaves or poultices, or the continuous current.

AFFECTIONS OF THE GLANDS.

We may now briefly consider the functional and structural affections of the glands of the skin. In many cases both the sebaceous and sudoriparous glands are simultaneously affected, as a result of some alteration in the relation existing between the blood and the excretory apparatus. At other times the causes are purely local.

SWEAT-GLANDS.—The secretion of the sudoriparous glands may be altered in quantity and quality. Excessive sweating is called **hyperidrosis**; diminished sweating **anidrosis**. If the mouth of the follicle is closed when the sweating is in excess, the acid liquid collects and distends the follicle, and gives rise to clear, pearly vesicles, known as **sudamina** or **miliaria alba**. If the follicle be at the same time inflamed, the fluid will be less clear and alkaline, and there will be a halo of redness round the follicle; this is known as **miliaria rubra**. Another condition is **dysidrosis**. Sometimes the colour of the sweat is altered to yellow or black, &c., but it must be confessed that the majority of these cases are probably impositions.

Dysidrosis is an inflammation of the sweat-glands and follicles of the skin, attacking by preference the hands, and also the feet. It is characterized at the outset by the presence of an excessive amount of sweat, mixed no doubt with more or less serosity, poured into and distending the sweat-follicles, giving rise to the appearance at the outset of

little sago-grain-like bodies, imbedded in the skin, especially along the sides and tips of the fingers and the palm of the hand. As the fluid increases in amount, actual raised vesicles and even bullæ form, which, however, rarely discharge, but shrivel up. The cuticle then becomes macerated and peels off, leaving behind a reddened, hyperæmic derma, a surface which, unlike that of eczema, never discharges. The disease is attended with a good deal of local heat, pain, and stiffness. The hand is generally much swollen. It lasts a varying time, on an average from 1 to 3 weeks. It occurs in weakly and debilitated subjects, and was first described by the late Dr. Tilbury Fox.

TREATMENT consists in wrapping up the inflamed parts constantly in linimentum calcis; and exhibiting *diuretics* in the early stage, with *nervine tonics* at a subsequent period.

SEBACEOUS GLANDS.—Sometimes the excretion of sebum becomes excessive, and it collects on the surface of the skin. If there be much stearin or margarin, the sebum will collect in flakes and crusts, but if there be an excess of olein, the skin will appear greasy. Both these forms of *seborrhœa* are common on the scalp, especially in babies. The skin often becomes tender and inflamed under the cakes of sebaceous matter, and eczema is set up.

Acne.—When from any cause the secretion of the glands does not escape, but remains in the ducts, a little point, which soon becomes black, is seen on the surface of the skin, at the mouth of the follicle, and a *comedo* is said to exist. If this retained excretion irritate the wall and set up a slight amount of inflammatory redness, *acne punctata* is produced. But if, in addition to the redness, there is a considerable amount of inflammatory exudation and new growth, forming hard masses, we have *acne indurata*; and when the points suppurate, *acne pustulosa*. When the acne-nodules are accompanied by great vascularity from varicosity of the adjacent venules, and by a great increase of the surrounding connective tissue, the variety is called *acne rosacea*.

Acne is most common at the time of puberty, and seems to have some connection with the development of the sexual organs, but some, and especially those outside the profession, have made too much of this, and cruelly regard those suffering from acne as the subjects of self-abuse. This is an opinion that should be warmly combated, as calculated to ruin many a good name. In young adults the disease is often met with associated with dyspepsia and derangement of the organs of generation, or as a result of exposure to heat, or from want of proper cleanliness.

The favourite seats of acne are the face, back, and shoulders, where the sebaceous glands are largest and most active.

TREATMENT.—Improve the general health; treat symptoms as they occur; evacuate the follicles by friction or pressure; and use stimulating applications. Sulphur ointment and soft soap are useful locally, and the application of a weak solution of perchloride of mercury is often followed by good results.

Molluscum contagiosum.—In this disease there are numerous small pedunculated or sessile tumours on the skin, varying in size from a pin's head to a large pea or even a bean. On the summit of each

may be seen the depressed aperture of the follicle, the disease being due to an enormous hypertrophy of the sebaceous glands, and not merely to retention of secretion. The contagiousness of this disease has been denied by some, but it must be allowed that in some instances there is unequivocal evidence of contagion. The writer has met with a case in which the trunk and lower extremities became covered with hundreds of these tumours, as the result of contagion from sexual intercourse with a woman who had some of these molluscum tumours on the thigh.

TREATMENT.—When recent, the glands may be readily squeezed out bodily, and the disease thereby cured; but if growths have existed for some time, they require more force to bring them away, and then they often crumble under pressure. Some writers recommend the application of nitrate of silver to the wall of the gland after the contents have been evacuated, but this is rarely necessary.

Sycosis, which must be distinguished from *tinea sycosis*, a vegetable parasitic disease, consists of simple inflammation of the hair-follicles and sebaceous glands. The disease seems to commence in the follicle or in the tissue outside, and to implicate gradually the glands. There is considerable redness, swelling, and suppuration, and if the disease be neglected, the glands will ulcerate out, and leave a thin, shining cicatrix, on which the hairs never grow again. The causes are various. Irritation of any kind, as shaving with a dull razor, or the application of irritating washes, may produce sycosis. The disease is remarkably obstinate, and may last for years.

TREATMENT.—The hair should be cut close and epilated early, and if suppuration have taken place, small scarifications should be made. By epilation the disease may at once be cured, or at least greatly checked; and it is vain to hope for any good effects so long as the hairs remain to keep up the irritation. *Tonics* and arsenic in some form will also be found useful in the later stages.

Xanthelasma or Vitiligoidea is due to an alteration of the epithelium lining the sebaceous follicles, accompanied by a fatty infiltration, and the deposit of a light-coloured pigment. It occurs in two forms, the *plane* and the *tuberous*, and presents itself in little yellow patches, especially about the upper eyelids, but it may be found on any part of the face, limbs, or palms. It is said never to occur in children, but a case has been met with at University College Hospital, in which a disease very much like acute general xanthelasma had shown itself in a young child one year old. It has been described by Dr. Tilbury Fox under the term *Xanthelasmoides*.

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